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With which is consolidated the Journal of Electricity

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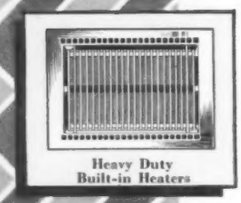
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Electrical West

With which are consolidated the "Electrical Journal," the "Journal of Electricity, Power & Gas," and the "Journal of Electricity"

C. T. HUTCHINSON, *Editorial Director*
W. A. CYR, *Associate Editor*
G. R. HENNINGER, *Associate Editor*

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Established 1887

G. C. TENNEY, *Managing Editor*
E. J. KNOWLTON, *News Editor*
B. H. SNOW, *Northwest Editor*

Contents

Editorial 1

Let 1929 Be a Year of Co-operation—Record Achieved in Reconstructing San Francisquito No. 2 Power Plant—Washington's Frequently Rejected Public Ownership Proposal Again Alive—Boulder Dam Bill Now on Statute Books—Electricity in an Underwater Tunnel—Public Ownership Profits Are a Matter of Bookkeeping—Genealogy of ELECTRICAL WEST.

Electricity's Important Role in the West's First Underwater Vehicular Tube 5

By ROMAINE W. MYERS.

A detailed portrayal of traffic control, lighting, ventilation and other electrical features of the new George A. Posey Tube in Oakland.

Electric Furnace Anneals 5.4 Lb. of Steel per Kw.-hr. 10

An illustrated description of the electric annealing furnace of the American Foundry & Machine Company at Salt Lake City.

Building Load at a Net Profit 11

By BERKELEY SNOW.

In this article the sales methods whereby the Pacific Power & Light Company succeeded in doubling its gross merchandising business in 1928 are described.

Reconstruction of San Francisquito No. 2 Power Plant 14

By H. B. GARDETT *and* A. R. ARLEDGE.

Engineers of the Los Angeles Power Bureau give an insight into the details of reconstruction of power plant No. 2 following its destruction in the disastrous flood resulting from the St. Francis Dam failure.

Rebuilding Two 17,500-Kva. Generating Units Under Emergency Conditions 17

By A. R. WINGO *and* C. M. ALLEN.

A description of the process of reconditioning the hydro-electric generating units of the San Francisquito No. 2 Power Plant.

Engineering Practice 20

High Transmission Crossing Built Over Vancouver Harbor 20
Watthour Meter Accuracy as Affected by Temperature Changes—II 24
Nomograph for the Determination of Inductance and Inductive Reactance Wires 27
New Books for the Engineer 27

Ideas for the Contractor 28

Shall We Have a Motor Forum? 28
A Proposal to Curb "Shyster" Building Financing 29
Centrally Located Transformer Vault Can Save Consumer Installation and Power Costs 32
Determining Speed and Power of Blowers 34

Better Merchandising 36

New Year "Platform" for the Retail Dealer 35
Clearing Slow Stocks With January Sales 39
Three-Point Attack Breaks Sales Resistance and Records 40
New Uses for Old Cleaners 41
Keep the Waffle Irons Burning 42

News of the Industry 44
Meetings 55
Contractors, Dealers and Inspectors 56
Personals 58
Manufacturer and Distributor 59
New Equipment 60
Industrial Barometer 62

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C. T. HUTCHINSON, President
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VIRGINIA
ELECTRIC *and* POWER CO.
Wins Highest Award

The Charles A. Coffin Foundation Gold Medal, given annually to the company which has done most for the development of electric railway service, has been awarded for 1927 to the Virginia Electric and Power Company, W. E. Wood, President. This company is under the executive management of Stone & Webster, Inc.

STONE & WEBSTER
INCORPORATED

OPERATE FINANCE BUILD

Electrical West

With which is consolidated the Journal of Electricity

C. T. HUTCHINSON
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Volume 62 | San Francisco, January 1, 1929 | Number 1

Let 1929 Be a Year of Co-operation

THE YEAR 1928 will occupy an important place in industrial history as the high point in an era of consolidation and co-operation. While business is becoming bigger, bulkier perhaps, industrial organizations, through the process of consolidation, are teaching the advantages of co-operation and interdependability. Not only must men and women in business work together but so must individual business units and finally all groups or divisions of any given industry. This has been one of the principal trends of the past year.

In the electrical industry especially there has been a growing spirit of tolerance, interchange of ideas on policy looking toward the good of the industry as a whole, in which all elements participate. With the central station as the big brother in the electrical family, it is of more than passing interest to note that the trend in its logical leadership is taking the form of greater consideration for the other branches. Through association activities and through the many informal conferences that take place periodically, policies now are formulated upon a "live and let live" basis. And as this spirit takes a stronger hold on mind and conscience, there will come greater freedom of opportunity to build more and better business for every branch of the industry, without such destructive competition as has marred progress in the past.

In reviewing the past year and looking at 1929 ELECTRICAL WEST offers this one suggestion: peace by negotiation is better than battle; there is always a happy middle ground in every controversial question which, when sincerely sought, may readily be determined.

And so, to the electrical industry, a Happy and Prosperous New Year.

Record Achieved in Reconstructing San Francisquito No. 2 Power Plant

RARELY indeed does it happen that a utility organization is called upon to rebuild completely a power house under conditions such as confronted the Los Angeles Bureau of Power and Light following the destruction of its San Francisquito No. 2 plant in the disastrous St. Francis dam flood last March. Almost without precedent was the situation faced by Bureau engineers when the waters had subsided, leaving only the bare hulks of the two 17,500-kva. generators resting upon their piers and the two penstocks extending down the hillside.

Of primary concern was the repair of the Owens River aqueduct to permit resumption of water flow to Los Angeles and restoration to service of power house No. 1. While this was done in the shortest possible time under great difficulties, the most interesting phase of the work was the reconstruction of the wrecked power plant No. 2. As described elsewhere in this issue, the problems involved were unique and the solutions devised under the most trying conditions were in keeping with the progress of engineering art.

The generating unit that was not in service at the time of the flood was overhauled, dried out and placed in service in three month. The other generating unit, operating for three hours after the flood of water, sand and gravel had passed over it, was completely rebuilt, largely on the job, and was back in service in eight months. Transformers were salvaged from gravel bars, dried out, and after a few minor repairs placed back in service. Use of the "Keller" method of "slip-form" construction permitted the erection of the power house walls in nine days. Many other interesting short cuts were devised.

Manufacturers deserve credit, not only for the extreme sturdiness of the generating units and transformers that permitted their salvage after the terrific battering they received from water, sand and rock, but also for the expeditious manner in which repair parts and new equipment needed in the reconstruction of the plant were supplied. So also is credit due the Bureau engineers and construction forces that restored the plant to service in record time. While it is to be hoped that other utility properties will not suffer from similar disasters, the Bureau engineers have developed a procedure that may prove valuable at some later time.

Washington's Frequently Rejected Public Ownership Proposal Again Alive

THE APPEARANCE of petition circulators throughout the State of Washington with an initiative petition for a "Public Utility Bill" is reminiscent of old times, for in this bill one recognizes the battle-scarred features of the Bone and Erickson attempts to expand municipal or public ownership of power in the state.

Followers of these attempts will recall the old original initiative measure No. 44 of 1922, the father of them all, which, with obvious socialistic intent, would have permitted any city in the state to enter practically any sort of business. Then came Mr. Erickson's proposed modification of that measure to embrace only the power business. Next appeared Mr. Bone's first bill, introduced in the 1923 legislature, to permit cities and towns owning electric properties to extend their operations beyond their own corporate limits. When this bill failed in the legislature, Mr. Bone initiated in 1924 the well remembered "Bone Free Power Bill," so-called, in which was retained the principal feature of his bill which had just died in the legislature and to which were added some features of the Erickson proposal, which would have permitted cities to exercise broad powers of eminent domain over electric properties and logging operations. This bill was hotly campaigned pro and con during the summer and fall of that year, and was finally defeated by a ratio of about one and one-half to one in the general election of Nov. 4.

The next attempt was the appearance in the 1925

legislative session of two bills relating to the sale of power by municipalities: the Jacobs Bill, permitting sales of energy outside the corporate limits of such cities, and imposing a tax on such sales; and the Reed Bill, which imposed a tax on sales both within and without city limits. Neither of these bills passed. Again, in the special session of the legislature in the fall of 1925, a bill similar to the Jacobs bill met a like fate.

Now comes our old acquaintance in new dress, but withal unmistakably our old acquaintance. Cloaked in the name, "Rural Water Power Bill," by which no doubt the smart city folk expect to interest their allegedly simple country cousins, the bill proposes to create public utility districts, comprising counties or portions of counties. Such districts are authorized to enter the domestic water, irrigation or power business, and may exercise the same old eminent domain (in language very similar to that of former proposals) over lands and properties necessary to the purposes of the act. Its stated purpose is to conserve the water and power resources of the state for the benefit of the people, in which is noticed another shrewd attempt to court favor for it by the use of a theme popular at the present time in the Northwest. But its prime joker, found well along toward the end of its many long and wordy clauses and sections, permits two or more contiguous utility districts to consolidate into one, obviously paving the way for the gradual expansion of utility district creation and consolidation until the entire state is thrown into one large district and state-owned power in toto is an accomplished fact. So again the wolf dons the sheep's skin.

The people of the state have consistently refused thus far to embark on a doubtful experiment having veiled socialistic tendencies. If history can be counted on to repeat itself, the current proposed attempt will be relegated to that limbo inhabited by its predecessors.

Boulder Dam Bill Now on Statute Books

CONGRESS has passed and the president has signed the so-called Swing-Johnson or Boulder Dam bill. Almost eight years of bitter argument, debate and discussion have been required to advance thus far in the solution of the vexing Colorado River problem. Seven years is the present minimum estimate of the time required to complete the project authorized by the measure. Under the most favorable circumstances at least a year must pass before surveys, estimates, plans and specifications can be prepared. And in the meantime there are many conditions in the bill that must be fulfilled before the first jack hammer sinks a hole in the canyon wall. A careful reading of the full text of the bill as presented in the news section of this issue will fill the mind of the most optimistic with grave doubts as to whether these conditions can or will be met. Until these provisions are satisfied, proponents of the measure must be content with a purely moral victory.

Electricity in an Underwater Tunnel

ORDINARILY a tunnel is not the type of project with which the thought of electricity is associated. Such works in the past have been the achievement of the civil engineer almost entirely.

But today's tunnel, that for the accommodation of automotive vehicular traffic especially, is complicated by problems of ventilation, lighting, traffic control, and drainage, all of which are best handled automatically by electricity. Indeed today electricity plays by far the most important role of all factors entering into the continued successful operation of a tube.

In the Oakland-Alameda Estuary Tube, whose electrical features are the subject of an interesting description in this number, this fact is demonstrated. To keep every operating mechanism working under any circumstance which might occur the unique characteristics of electricity, by which it may be made to control and direct itself, have been brought into play in new and interesting ways.

When other similar structures are built, as undoubtedly they will be, the pioneering done on this particular project will point the way to the simplified solution of corresponding though perhaps larger problems of electrical engineering.

Public Ownership Profits Are a Matter of Bookkeeping

RECENT newspaper statements have credited the politically-owned electric system of the Modesto Irrigation District with a remarkable success in the distribution of electricity. Stress is laid upon the fact that the district's report for 1927 showed an investment in power facilities of $1,709,371, with a gross income of $433,871 and a net profit of $190,843.79, and rates are described as extremely low for both urban and rural service. Indeed the system is glowingly termed the "Ontario of the United States" in its general development of rural territory through low rates and excellence of service.

What are the facts?

The Modesto Irrigation District distributes and sells within its boundaries two essential public utility commodities, water and power. Water is sold exclusively for agricultural purposes. Power development is incidental to irrigation but is essential to the success of the project.

In its general balance sheet of Dec. 31, 1927, the Modesto district reports an outstanding bonded indebtedness for water and power of $4,488,870.49. It reports interest payments to the amount of $252,417.22, at an average interest rate of 5.623 per cent per annum, of which the power system was charged $63,450, or approximately 25 per cent. The gross income reported from power for 1927 was $433,871. Expense borne by the power system was given as: operation and maintenance $107,577.21; depreciation $72,000; bond interest $63,450. Added together and deducted from the gross income these items leave the supposed profit of $190,843.79. It will be observed from the accounts listed in the district's report that the power system bears none of the expense of construction, operation and maintenance or depreciation of the water storage and diversion facilities of the district. Since power was recognized, at the outset, as an indivisible element, without the support of which the irrigation project could not be financed, it is difficult to conceive why the district's accounts failed to apportion to the cost of power its fair share of the entire dual project.

As far as the accounts go the electric system's expense begins at the power house. The fact that the water which generates the electricity is stored in a reservoir designed and provided in part, at least, for power production, is disregarded or ignored. All expense of the irrigation district is paid from the proceeds of taxes assessed against the real property within the district, urban and rural. The rate is $6 per $100 of assessed valuation. Nothing is charged to power. The total assessed valuation of the district for 1927 is reported as $7,436,880. The tax rate of $6 raised

$446,212.80 for the operation of the district. This latter sum paid all the expense of the irrigation project, the fixed costs of the dam, maintenance, etc., and allowed the revenues of the electric system to be untouched except in so far as the electric system itself was concerned.

Stored flood waters in any stream have a market value for the production of power. Private companies in this state pay for such water at rates varying from two to three and one-half mills per kilowatt-hour of power produced. It is difficult to see why this electric system does not pay the value of the water it uses.

As an illustration of the bookkeeping methods used to show "surplus profits" in the electric system, the following makes clear the manner in which these so-called surplus profits are amassed. It is stated the electric system is worth $1,709,371 "actual investment." Applying the average interest rate of 5.623 per cent against this sum will raise the interest charges of the electric system from $63,450 to at least $96,000, a deduction of some $33,000 from the total net profit of $190,843.79; if 25 per cent of the requirement of $69,425 for bond redemption is charged to power the net is reduced by another $17,600.

Further, if this investment of $1,709,371 were raised to include its fair share of the dam and other facilities, the bond interest and redemption would be split by half, instead of nothing for redemption and 25 per cent of the interest. This allocation would charge some $160,920 to the electric system, and the purported profits would still further dissipate into thin air.

Still another reduction would be made if the Modesto district had paid taxes for the support of the state and federal governments on the electric profits as private companies are required to do. Private electric utilities pay about 10 per cent of their gross income as taxes. Had Modesto paid this, the sum of $43,387 would have been charged to the still dwindling profits.

The foregoing examples of accounting as practiced by the Modesto district would not be allowed by the regulatory commissions which control every act of private utility companies.

The district's report shows that the consumers of electricity residing within the city of Modesto, which has a population of about 16,000, contributed about three-quarters of the electric income. These people reside within the jurisdiction of the irrigation district and receive no direct benefit from the district other than their electric service, although taxed, during 1927, $6 per $100 of assessed value for the district's support. This tax, therefore, must be considered an addition to their electric bills. When so considered the claims made for low rates become empty boasts.

The tax rate in Modesto for 1928 was slightly less than in 1927. Here are the tax rates for the year 1928: for city purposes $1.50; for county purposes $3.40; and for the irrigation district $5.60. The rate of $5.60 paid to the Irrigation district is, as far as these city residents are concerned, a donation, gratis.

Further exemplifying this tax, assume a home-owning citizen in Modesto with property assessed at $1,000 for district purposes at $5.60 this year. His total tax for the district would be $56 per annum, or about $4.60 per month. If this citizen used for ordinary lighting purposes about 30 kw.-hr. of electricity per month, his bill would be $1.90 monthly, to which must be added this tax of $4.60, making his total electric bill $6.50. The private company's bill for the same amount of electricity in comparable territory would be $2. If this citizen had his home wired for complete electric service, such as heating, cooking, etc., at an average consumption of 200 kw.-hr. per month, his bill in Modesto at district rates would be $5.55 for electricity, plus the tax of $4.60, or a total of $10.15. The private company's bill for the same service would be $7.35.

We might sum up the entire Modesto situation as follows:

1. Municipal residents are taxed to carry a large portion of the expenses of an agricultural water and power project.

2. The farmers of the irrigation district have built up a very successful enterprise in their own behalf at the expense of the city residents within their district, and at the further expense of all residents of the county outside the district. This is brought about by the fact that the district's total investment in water and power properties amounting to $7,208,854.24 is tax free; that is, the district property does not pay any taxes. The exemption of this property from taxation throws the burden of county taxes on other property.

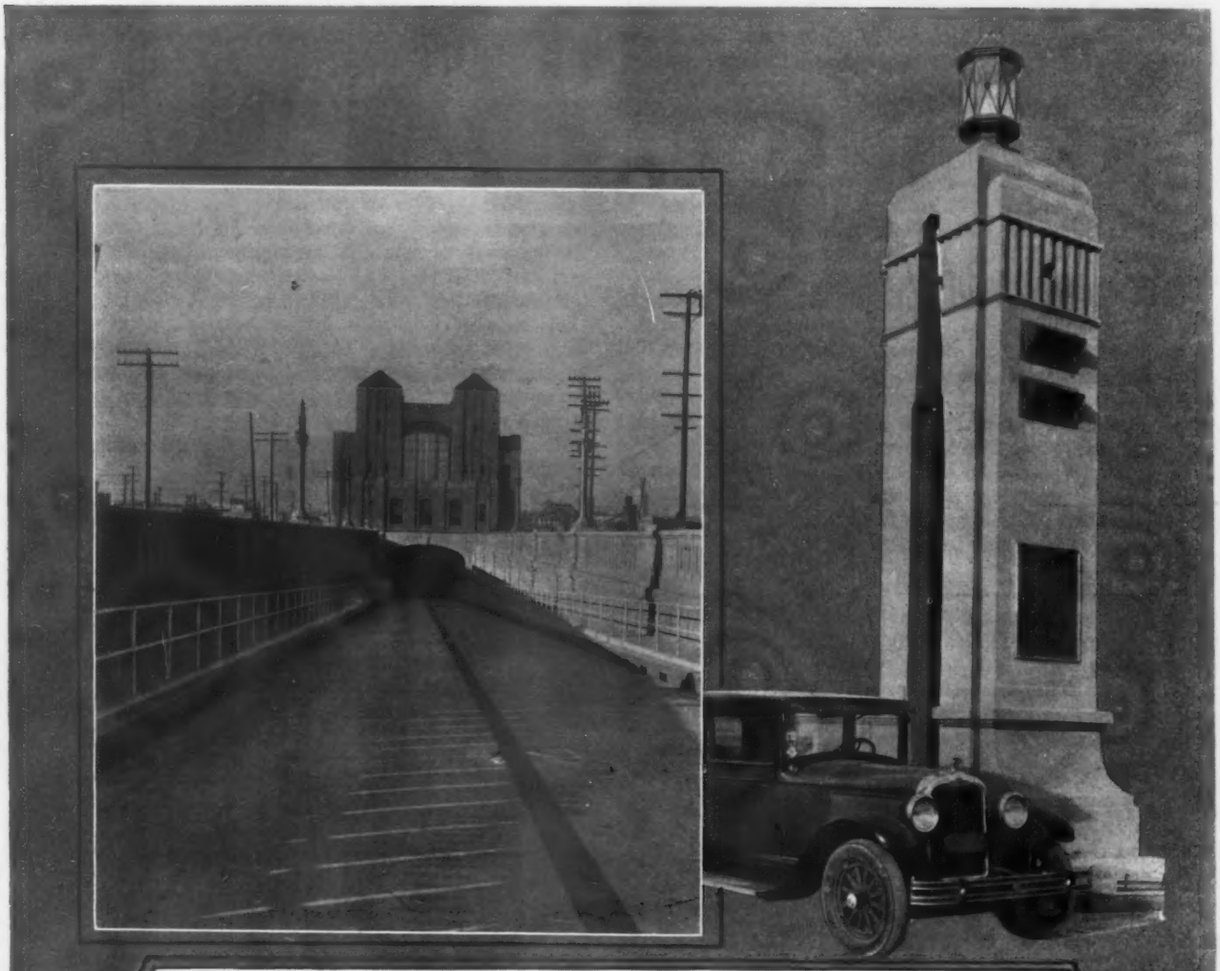
3. The enormous profits reported annually are accounting profits.

It's all in the bookkeeping.

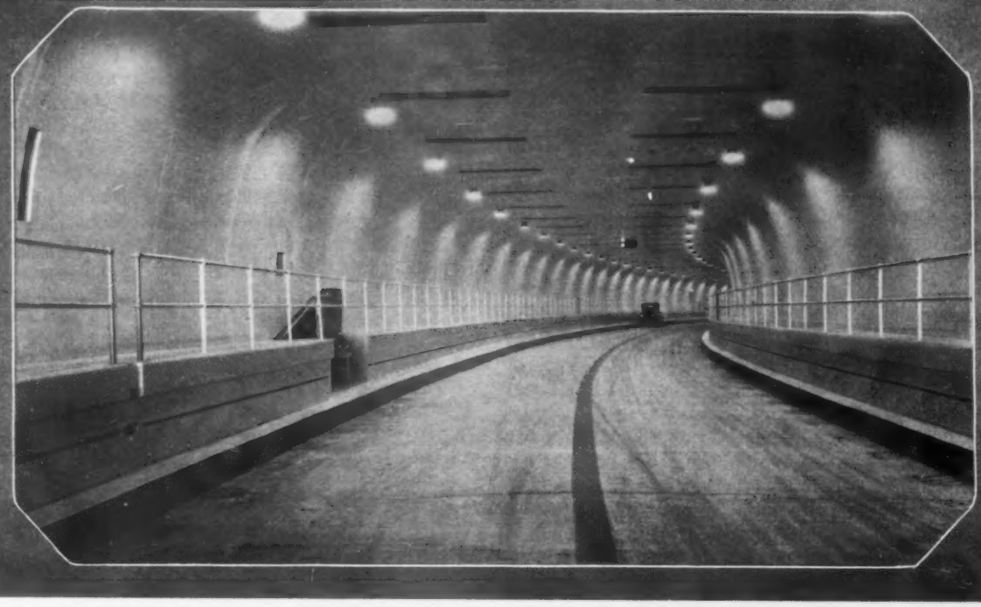
Genealogy of ELECTRICAL WEST

IN 1887 there was founded in San Francisco *Pacific Lumberman, Contractor and Electrician*, the electrical department of which was edited by George P. Low. As electrical development in California progressed it was deemed advisable to divorce the electrical department from the parent publication. This was done in July, 1895, and the new paper was called *Electrical Journal*, with Mr. Low as editor and publisher. To avoid confusion with *Electric Journal* founded at about this time by the Westinghouse Company in Pittsburgh, Pa., the name of the Pacific Coast paper was changed in September, 1895, to *Journal of Electricity*. The paper was brought out as a monthly under this title until July, 1899, when the name was changed to *Journal of Electricity, Power and Gas*. After the San Francisco fire of April, 1906, the Technical Publishing Company was organized and publication was changed to weekly and continued so to January, 1917, when the schedule was changed to semi-monthly publication. On January 1, 1919, the name was again changed, the paper reverting to the title, *Journal of Electricity*. In September, 1919, the paper was purchased from the Technical Publishing Company by the McGraw-Hill Company. On February 1, 1921, the McGraw-Hill Company of California was organized and the name of the paper changed to *Journal of Electricity and Western Industry*. It was found advisable to revert to the title, *Journal of Electricity*, on July 1, 1923. On January 1, 1927, the paper became ELECTRICAL WEST with a monthly publication schedule. The magazine has always been published in San Francisco.

Editorial policies of the paper, first as a department in *Pacific Lumberman, Contractor and Electrician*, and later as *Journal of Electricity*, were directed by George P. Low as editor until early in 1905. He was succeeded by C. L. Cory, dean of the College of Mechanics of the University of California, who held the position of editor until 1907. From 1907 until 1911 the paper was directed by A. H. Halloran as managing editor. In 1911 Robert Sibley became editor, a post he held until August 1, 1922, when he was made editorial director. Since January 1, 1923, C. T. Hutchinson has been editorial director and G. C. Tenney managing editor. In addition the present staff consists of W. A. Cyr, associate editor, G. Ross Henninger, associate editor, E. J. Knowlton, news editor, and B. H. Snow, Northwest editor.



LOOKING down the Alameda approach to the estuary tube (above), showing portal building. At right a pylon at street level of the approach showing slot and electric gate arm inside and traffic signal and siren opening on its face. Below, the interior of the tube on a curve, in which traffic signal, ceiling air ports, hub height air slot, lighting and splicing chamber with cover raised are to be seen.



Electricity's Important Role in the West's First

Underwater Vehicular Tube

Between Oakland and Alameda, Calif.

By ROMAINE W. MYERS
Consulting Electrical Engineer

Cross section diagram showing relative location of air ducts and vent slots.

THE "George A. Posey Tube," named for and in recognition of the valued services of its chief engineer, George A. Posey, is the largest underwater tube in the world. It has an outside diameter of 37 ft., the largest heretofore built being 30 ft. in diameter. The Posey is the first pre-cast tunnel ever built. Each section is 203 ft. long and is made of reinforced concrete, built in a dry dock, then towed across the bay and sunk in position, an open trench having been prepared for its reception.

The tube starts in Oakland in the center of Harrison St., at the south line of Sixth St., proceeds southerly on the center line of Harrison St., first with an open retaining wall approach to the Oakland portal, where a building houses the ventilation of electrical equipment for the Oakland portion of the tube; thence southerly with a covered and mechanically ventilated portion down and under the estuary and then up and curving into Webster St. in Alameda, emerging at the Alameda portal, where a building houses the ventilation and electrical equipment for the Alameda portion of the tube; and thence continuing with an open retaining wall approach to the center of Webster St., just north of Tynan Ave., Alameda.

The total length of the tube is 4,436.5 ft. of which 3,545 ft. is covered and furnished with mechanical ventilation, lighting and signals.

The roadway provides for two lanes of traffic, one in each direction. The width between curbs is 22 ft. 10 in.; between sidewalks, 24 ft. 8 in., and between walls 32 ft. An elevated sidewalk 3 ft. 5 in. wide is provided on either side of the roadway, with pipe guard rails and step niches to the roadway at 194-ft. intervals. The height from the crown of the roadway to the ceiling is 14 ft. 10 in.

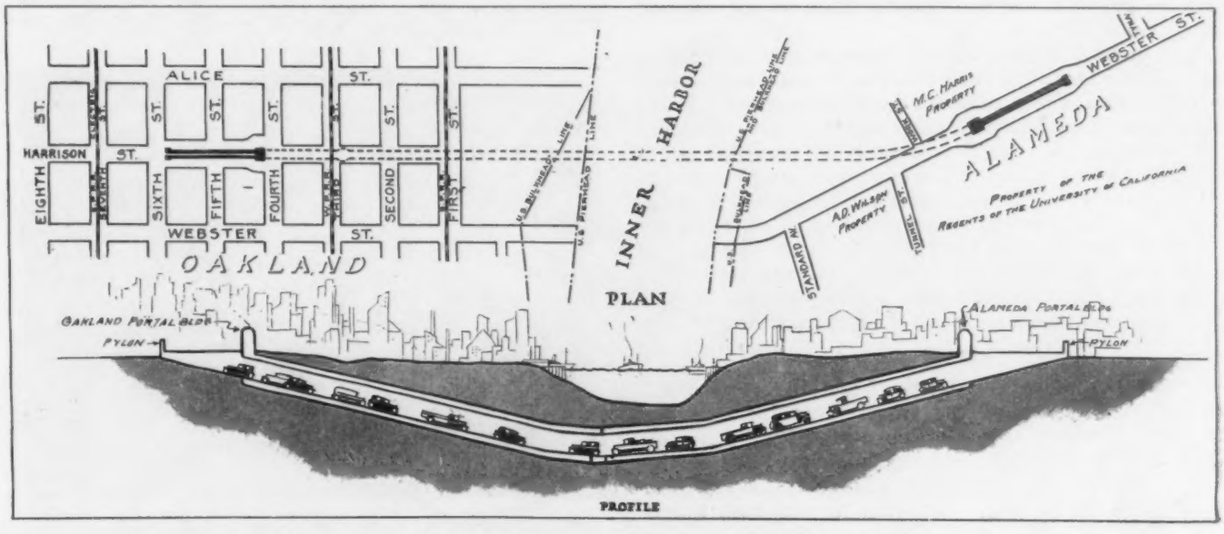
Continuous Transverse Ventilation

The tube is mechanically ventilated by what is known as the continuous transverse method of ventilation. Fresh air is supplied by eight large fans driven by 75-hp., four-speed motors and carried in large air ducts separated from the roadway. The fresh air is delivered through flues at 15-ft. intervals to a continuous expansion chamber under each sidewalk. From this chamber the air is delivered to the roadway through continuous adjustable horizontal slots at automobile hub-cap level.

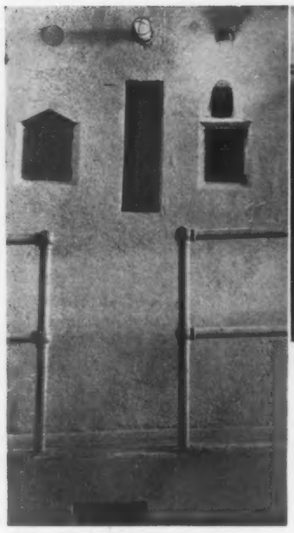
This fresh air mixing with the warm gases rises vertically to the ceiling, assisted by ceiling ports in pairs at 15-ft. intervals under a suction pressure generated by eight large exhaust fans driven by 75-hp., four-speed motors. The suction caused by these fans draws the vitiated air through large air ducts over the ceiling slab to the portals where it is exhausted into the atmosphere through large stacks. The maximum amount of fresh air which may be supplied is approximately 1,000,000 cu.ft. per min., changing the entire volume of roadway air 40 times per hour.

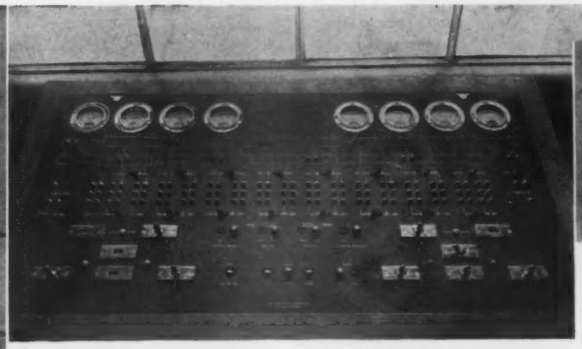
Power Supply

It is imperative that uninterrupted service be furnished the tube, therefore three separate services have been installed, the supply being 4,000 volts, 3-phase, 4-wire.

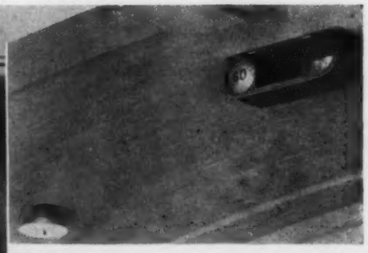


Plan and profile drawing indicating extent of tube under ground and under water and length of approaches.





A patrolman's traffic control station, at left, with telephone, fire alarm and traffic signal control and niche for fire extinguisher. Above, desk top panel in the terminal buildings, with control of all traffic lighting and instruments and pilot lights showing lights on and speed of fan motors.



Above, left: one of the type of lighting units employed in the tube, and *right* the signal to motorists to "go," "stop motor" and "stop" respectively.

Service No. 1

Service No. 1 is supplied from Station A of the Pacific Gas and Electric Company. It is a separate underground service with feeder regulation to high-tension switchboard "O" at the Oakland portal building.

Service No. 2

Service No. 2 is an underground service supplied from Station "L" of the Pacific Gas and Electric Company to high-tension switchboard "O" at Oakland portal building.

Service No. 3

Service No. 3 is an underground and overhead service supplied by the City of Alameda's municipal plant (Great Western Power Company service) to high-tension switchboard "A" at the Alameda portal building.

Service No. 1 is the normal service; upon its failure No. 2 service is automatically cut in, and upon the failure of both No. 1 and No. 2 services the No. 3 service automatically takes the load, thus completing a cycle of preferential switching.

The Oakland high-tension switchboard "O" and the Alameda high-tension switchboard "A" are interconnected with two 4-kv. cables, the cables being installed under the west pedestrian walk of the tube.

At each portal building the 4,000-volt power is transformed to 440 volts for power and 220/110 for lighting and heating. At each building there are three 333-kva. 2,300 to 440-volt, and one 25-kva. 2,200 to 220/110-volt transformers.

The three 333-kva. transformers supply the motor load. The primary of each 333-kva. transformer is connected by means of a separate double-pole oil switch, the oil switches being bused for star connection with a floating neutral connection for the purpose of switching automatically to two transformers in case of trouble developing in any one transformer. The secondaries of transformers are normally connected in closed delta but if one transformer becomes inoperative the tripping of one of the double-pole oil switches will also trip out a secondary circuit breaker, thus leaving the secondaries of two transformers connected in open delta.

MOTORS

Possibilities of various types of motors were investigated for operation of the fans. This included d.c. motors with rotary connectors, brush shifting a.c. commutator motors, and squirrel-cage motors of the single-speed, two-speed, three-speed, and four-speed types. The wound rotor (slip ring) induction motors both single and two-speed were also carefully considered.

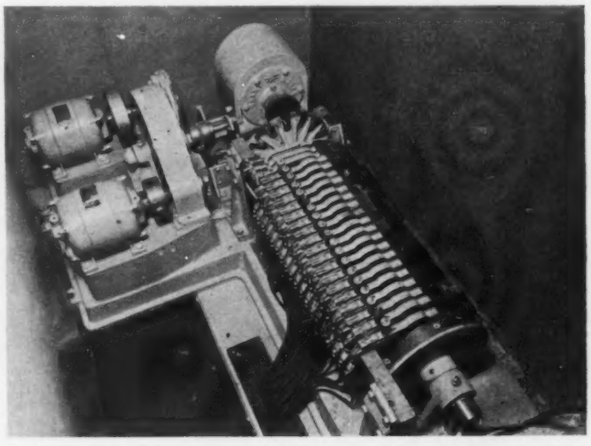
Inasmuch as the air capacity of a fan varies directly as the fan speed, but the horsepower varies as the cube of the speed, it is obvious that it is more economical to operate a large number of fans at a low speed for a given amount of air. If less air is required some of the motors are turned off; if more air is required the speed is increased.

After a study of traffic operating schedules it was determined that the four-speed, squirrel-cage motor was the most economical for operating the fans; in fact it will effect a saving of approximately $7,000 in power the first year over the variable speed slip-ring type of motor.

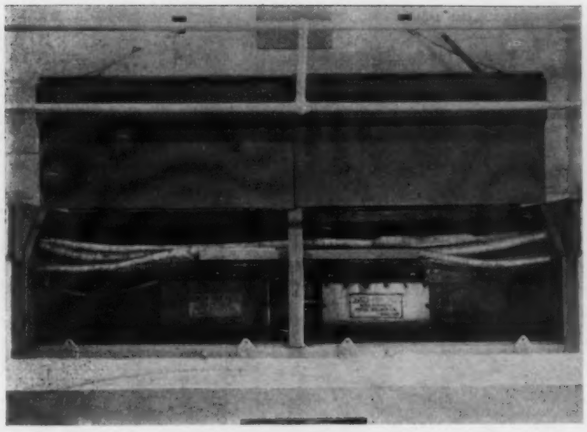
A specification therefore was drawn covering the mechanical and electrical details, setting forth minimum efficiencies, starting torques, starting currents, etc. Bids were taken and contracts let for 16 motors each four-speed, the synchronous speeds being 450,600,900 and 1,200 r.m.p.; the horsepowers 5, 15, 30 and 75 respectively. Rigid tests were required at the factory, including electric dynamometer, blocked rotor, no-load saturation and high-voltage puncture tests on each winding and speed of each motor. These tests were observed and certified by a national testing laboratory.

Two and 3-hp. motors operate damper doors installed in the ducts adjoining fans. These doors open after the fan attains a predetermined speed, and also close at this speed before the fan stops. The governor on the fan motor operates a mercury switch which energizes the damper-door motors. These motors are equipped with electric brakes and limit switches provided with red and green tell-tale lights. There are eight 2-hp. and eight 3-hp. damper-door motors in all.

The surface rain water from the Oakland roadway approach is taken care of by the installation at the Oakland portal building of two 7½-hp. and one ¾-hp. ver-



Motor-driven drum switch by which twelve combinations of operating speeds of the eight four-speed fan motors are controlled.



Splicing chamber under the pedestrian walk with cover raised, showing two 2.1-kva. lighting transformers and asbestos-sheathed lead-covered cables.

tical sump pumps. Motors are operated automatically by ball floats connected to mercury switches. Two 5-hp. and one ¾-hp. sump pumps are installed at the Alameda portal building for the same purpose.

In the center of the tube, at its lowest point, are two 25-hp. and one 3-hp. vertical sump pumps. These are operated by float switches. There is installed also at this point a long-distance water-level indicator which records graphically the level of the water. The graphic instrument is installed on the operator's switchboard in the Oakland portal building,—at a distance of approximately 1,800 ft. On the same graphic instrument are two chronograph pens which record the time of operation of each of these pump's 25-hp. motor.

Control of Fan Motors

The eight four-speed motor-driven fan units in the Oakland portal building are operated as one system, the eight motors in the Adameda portal building as another system.

Each system is controlled automatically from a carbon monoxide recorder, a program clock, or at will from push buttons.

The control equipment for each system is arranged to select the following combinations:

Schedule

Motors Operating				Motors Operating			
No. 0,	all motors	off.		No. 7,	4 motors	8-pole	speed.
No. 1,	4 motors	16-pole	speed.	No. 8,	6 motors	8-pole	speed.
No. 2,	6 motors	16-pole	speed.	No. 9,	8 motors	8-pole	speed.
No. 3,	8 motors	16-pole	speed.	No. 10,	4 motors	6-pole	speed.
No. 4,	4 motors	12-pole	speed.	No. 11,	6 motors	6-pole	speed.
No. 5,	6 motors	12-pole	speed.	No. 12,	8 motors	6-pole	speed.
No. 6,	8 motors	12-pole	speed.				

The foregoing combinations are selected by means of a motor-driven drum switch, illustrated here, which is controlled either by contacts on the C O recorder, program clock or by push button.

The control equipment is so arranged that it is impossible for the braking or regenerative torques of the motors to be applied to the fans, chains or other driving mechanism when changing from a higher to a lower speed. It allows the fans to coast down to approximately the next lower synchronous speed before the power is connected to the winding. The timing of this period is done by the reverse speed of the drum through gearing or slow-speed motor, an arrangement proposed by the writer to insure a very positive time interval before the next receding operating position is attained.

At each motor is an individual motor controller contained in a steel cabinet. In it line and pole changing contactors are provided for time intervals between the starting of the various motors so that all motors cannot be thrown on the line at the same time. There are also switches provided for starting and stopping these motors by hand at any of the four speeds.

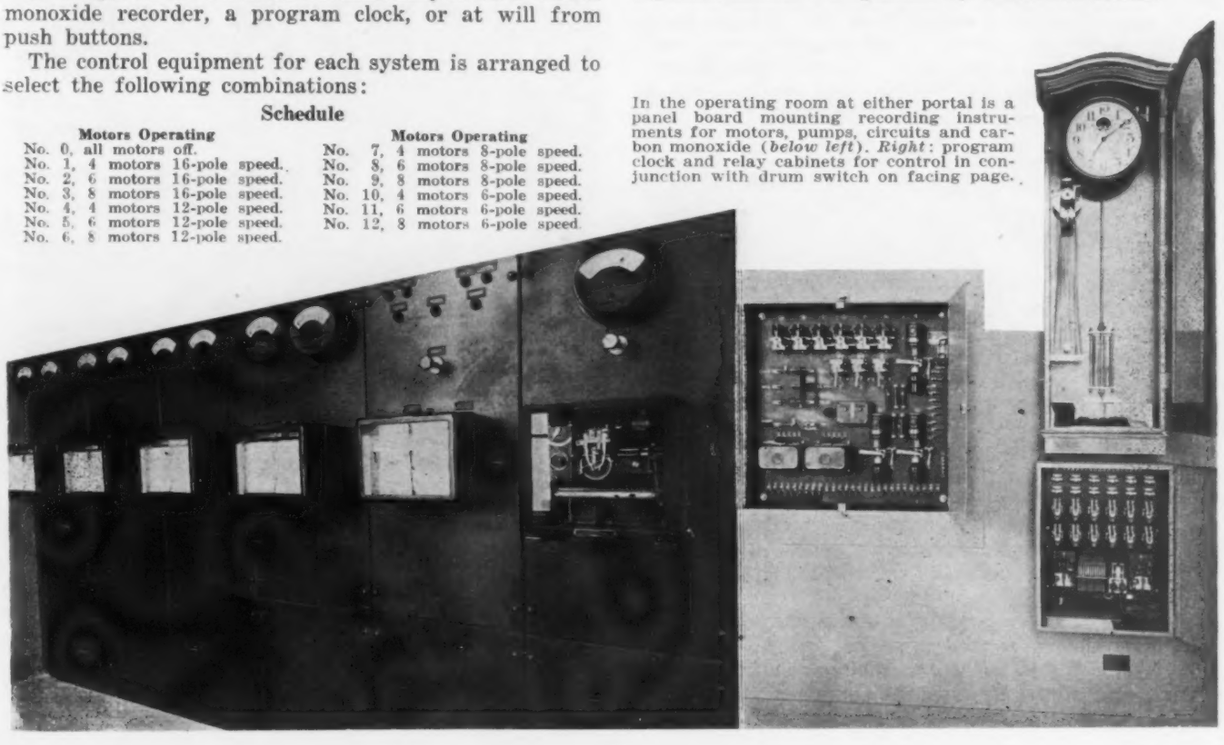
Operators' Switchboards

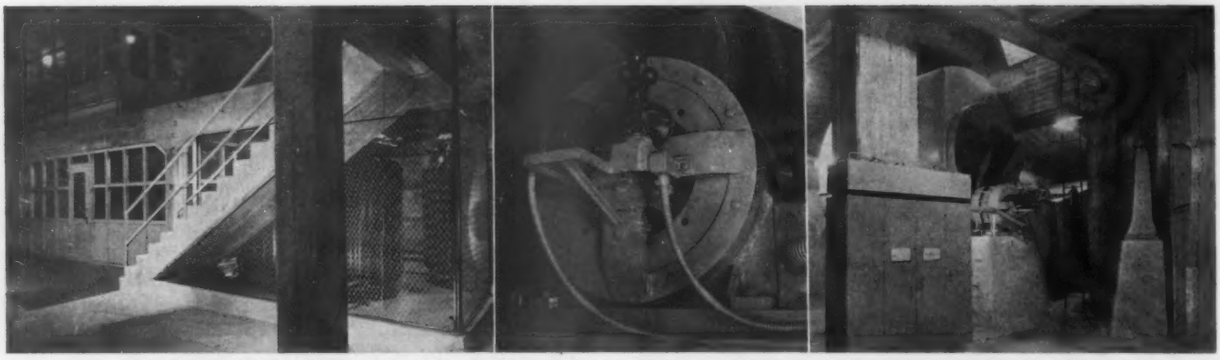
Operators' switchboards are installed in the operating room at each portal building.

Upon each board is mounted a graphic recording tachometer from each of the eight motors. Indicating tachometers for each of the eight motors. Indicating end of tube are also installed on each board. This arrangement operates as a check from the operator at one end to the operator at the other end as to the number of fans operating and the speed of each. The graphic records give a record of actual operation which may be valuable in case of accident. They also act as a check upon the operators and the automatic control equipment.

Also on this board is a graphic water-level indicator with chronograph pens which record time of operation of center sump motors, as already described. Another graphic instrument records the time of operation of north or south-bound traffic signals. All graphic recording instruments are operated by Telechron clocks.

In the operating room at either portal is a panel board mounting recording instruments for motors, pumps, circuits and carbon monoxide (*below left*). *Right*: program clock and relay cabinets for control in conjunction with drum switch on facing page.





Location of main high and low-tension switchboards at either portal building. The lighting switchboard is seen enclosed on the mezzanine at extreme left; the high-tension board "0" and under the stairs the transformer enclosure. At center may be seen a close-up of blower fan 75-hp. four-speed motor with governor controlling switch for operation of damper door motors. At the right a typical blower room set up, showing blowers, motors, automatic fan door mechanism at right of motor and motor control cabinet in foreground at left of motor.

Tell-tale lights are installed in each board showing power service available, alternate tunnel light circuits in service and service from each of the 333-kva. transformers.

On the extreme right-hand panel is mounted a voltmeter with three-phase switch and also a graphic recording potentiometer which records the carbon monoxide gas on a scale calibrated from 0 to 10 parts in 10,000. Adjustable contacts are provided in this instrument so that contacts can be made or broken at any desired point within range of the instrument, thus making it possible to operate motor control apparatus and also ring a bell if the percentage of this gas rises too high.

The carbon monoxide detector consists essentially of a cell and a flow meter. The cell contains an active chemical and thermocouples. The chemical, known as Hopcalite, has for its purpose the catalytic oxidation of carbon monoxide. As such it generates heat in proportion to the amount of carbon monoxide present. The thermocouples, which are connected to the graphic recording potentiometer, thus register the carbon monoxide present in the sample which is taken from the exhaust ducts. The flow meter is a device which passes a continuous sample through the Hopcalite at a uniform rate of flow. Thus the carbon monoxide is recorded continuously on the chart in parts per million.

Traffic Signals

The control of traffic conditions in the tunnel is in charge of officers stationed at intervals where telephone, fire alarm and traffic signal light control buttons are provided.

Three kinds of traffic signals direct the motorist using the tube; green for "go ahead," red for "stop," and a special "stop engine" signal. Normally only the green lights show and the traffic flows along as rapidly as possible. Should trouble arise, which the traffic officer judges will disappear quickly, he pushes a stop button, whereupon all the traffic lights from the entrance up to the point of accident will show red, thereby stopping oncoming traffic in that lane. The remaining lights will stay green, permitting the traffic ahead to clear itself.

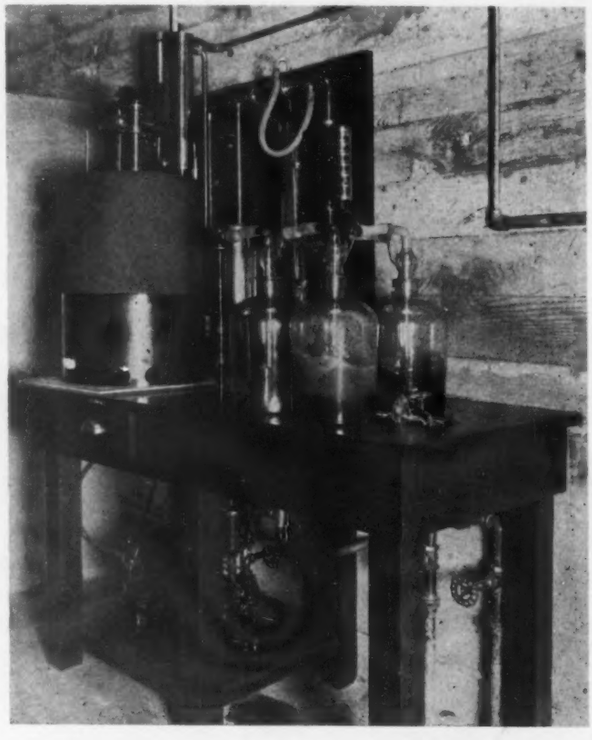
If an automobile is stalled the officer telephones for the emergency truck maintained in constant readiness. The traffic in the meantime is passed around the stalled machine.

If, in spite of all precautions taken to prevent it, there should be trouble with the ventilating system, the "stop engine" signal will be flashed, thereby preventing further contamination of the air until the equipment is put into operation again.

When traffic can start again the officer in charge will press a button and the green lights again will show.

All changes in the traffic lights made by the traffic officers are registered by means of pilot lights on the operator's desk board in the control room at each portal building. If necessary the chief operator from this board can stop traffic at any point.

Each operator's desk board has eight tachometers which indicate the fans in operation and their speeds. Pilot lights show the location of all fire alarm, telephone and traffic signals. On this board is a push button for operation of a siren at the entrance pylon and also buttons for operation of an electric gate at the pylon for the purpose of closing the incoming traffic lane. On this board also is a push button to operate the drum control

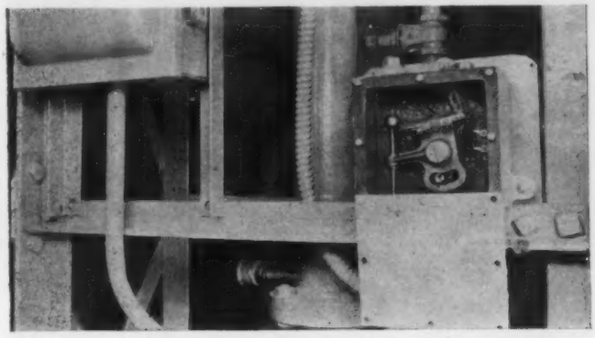


Carbon monoxide detector, operating by means of a cell and flow meter and recording percentage of the gas by means of thermocouples connected to recording potentiometer on the panel board in portal building and operating relays to increase fan motor speed if necessary.

switch for increasing the speed of all ventilating blower motors. This is provided for emergency purposes.

Tube Lighting

A careful investigation was made of the illumination requirements of the tube. An adequate illumination intensity to permit the safe movement of automobiles under



Usual type of vertical sump pumps in each portal building and at the low point of the tube are operated from mercury switches as shown here connected to floats in the sumps.

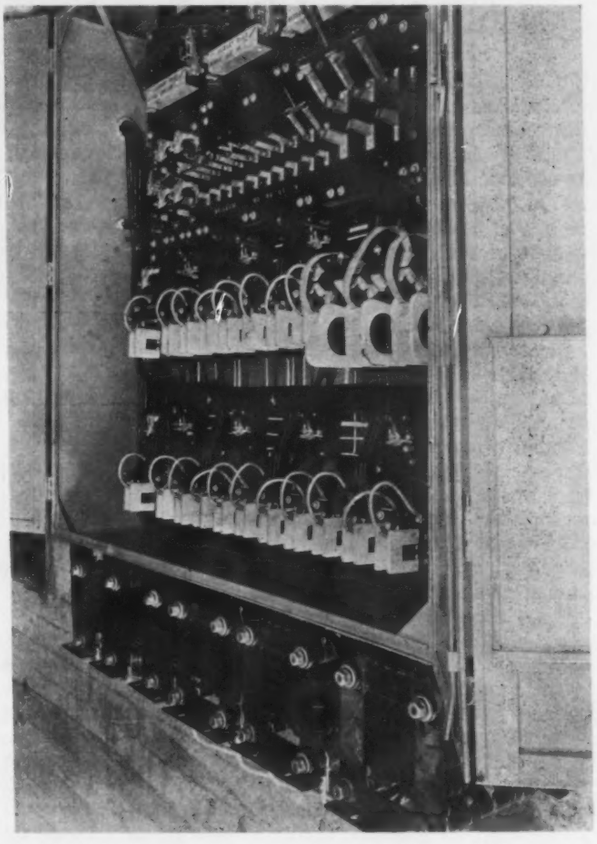
various speeds is necessary. Vaporproof reflectors with 100-watt lamps are spaced opposite each other at 20-ft. intervals. The side walls and ceiling are painted white so that maximum reflection is obtained. The net result is a uniform, pleasing illumination that gives the motorists a feeling of confidence and safety. Average intensity has been found to be between 14 and 20 foot-candles. Motorists are instructed by road signs to extinguish headlights at night upon entering the tube.

Lighting units are on two separate circuits receiving current from two 2.1-kva. transformers, 2,300/115 volts, and installed every 400 ft. in splicing chambers shown here. The 2.1-kva. transformers are of the air-cooled type placed in a watertight box with necessary 2,300-volt cut-outs. One 2,300-volt circuit is fed from the Oakland portal building, the other from the Alameda portal building.

All wires installed in the tube are 30-per-cent Para rubber with a minimum test voltage of 2,500 volts for 110-volt service. The wire was all tested by a national testing agency at the factory. A 70-per-cent high potential test was applied after the wires were installed and joints made.

While in no way an exhaustive description of the electrical features of the tube, this summary will perhaps serve to show the important part electricity plays in its operation. Each feature might well merit an individual story of its own, for in planning the tube the peculiar problems for which it was designed determined the course of action necessary to accomplish the result.

Interesting, too, would be the fact that practically all details were approached from a completely fresh viewpoint. Certain things were desired. The problem of attaining these objectives was attacked directly. Later



Interior of individual controller cabinet for each 75-hp., four-speed fan motor. Resistance for starting on 30-hp. and other lower steps shown at top. Provision is made also for manual operation of switches.

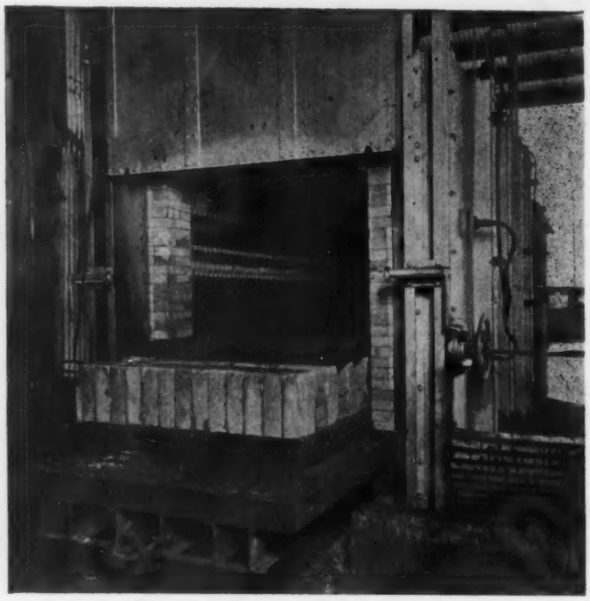
comparison with the methods employed in constructing the New York-New Jersey Holland Tube has revealed important differences and some original methods which might not have been developed had the Eastern pattern been adhered to for this quite different Western undertaking.

Summary of General Data in Connection With George A. Posey Tube

Total length of tube	4,436.5 ft.
Total length of covered portion	3,545 ft.
Maximum depth of roadway below mean low water	67.74 ft.
Outside diameter of tube	37 ft.
Inside diameter of tube	32 ft.
Distance between curbs	22 ft. 10 in.
Distance between sidewalks	24 ft. 8 in.
Width of sidewalks	3 ft. 5 in.
Head room, roadway to ceiling	14 ft. 10 in.
Oakland grade	4.59 per cent
Alameda grade	4.50 per cent
Capacity of tube per hour	4,224 vehicles
Speed of traffic	20 miles per hr.
Spacing of vehicles	50-ft. intervals
Maximum supply of fresh air	1,000,000 cu.ft. per min.
Number of air changes	40 per hr.

Dilution of carbon monoxide to air	4 parts in 10,000
Dredging	605,000 cu.yd.
Dry excavation	98,000 cu.yd.
Concrete	75,000 cu.yd.
Reinforcing steel	15,000 tons
Cement	130,000 bbl.
Time to complete construction	40 months
Number of precast segments	12
Length of each segment	203 ft.
Weight of floated segment	5,000 tons
Total displacement fully submerged	7,000 tons
Ballast required to sink segment	28,000 tons
Depth of flotation of segment unloaded	26 ft.
Average time to sink segment to grade	3 hr.

Electric Furnace Anneals 5.4 Lb. of Steel Per Kw.-hr.



General view of furnace showing car on which castings are loaded.

RECOGNIZING the necessity for more accurate and uniform heat treatment of metals, including annealing, ageing and normalizing, the American Foundry & Machine Company, Salt Lake City, has recently installed an electric annealing furnace, replacing coal fired equipment. The installation of this electric furnace, and the results of its operation, have proved to the entire satisfaction of the management of this institution the greater economy, efficiency and practicability of electric heat in their operations.

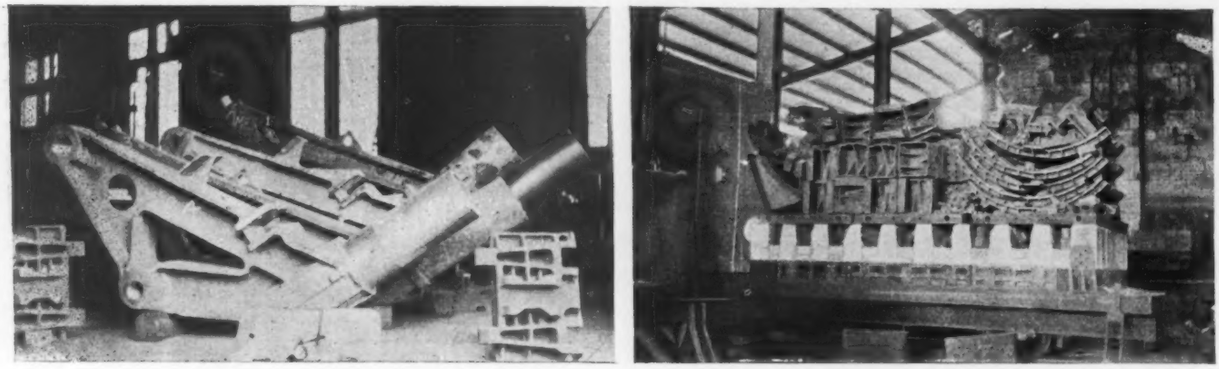
In foundry work, such as is conducted by the American company, it is found that ferrous metals (iron, steel and their alloys) like most other metals, develop a degree of hardness when rolled, drawn, forged or cast. In addition to this quality, castings acquire strains caused by uneven cooling in the mold, and it is to relieve these strains and impart softness to metal that iron and steel are annealed. The annealing of iron and steel is accomplished by heating the metal to temperatures of from 1,400 to as high as 1,900 deg F., depending on the alloy, after which the material is slowly cooled to normal temperature.

Until about four years ago all commercial annealing was done in fuel-fired furnaces, using coal, coke, oil or gas, and these methods are still in quite general use. In the past few years, however, the metal working industries have been giving favorable consideration to the electric furnace, and the tendency is now, where maximum quality and uniformity of product are desired, to adopt this method of operation.

The electric furnace recently installed by the American Foundry & Machine Company was manufactured by the Swindell Electric Company. It is 5 ft. 6 in. wide, 11 ft. deep, and 5 ft. 6 in. high, inside measurements. The heating units are of a heavy ribbon type, and are supported on the side of the furnace walls by special insulators, built into the fire brick lining. The furnace is heavily insulated, so that there is very little loss of heat through the walls. The temperature of the furnace is controlled automatically, and is maintained within approximately 15 deg. F. of the operating temperature of 1,640 deg. The temperature of the units is not much above the annealing temperature, thus insuring a uniform distribution of heat throughout the charge.

In a recent run of this furnace, 251 pieces, consisting of 21 various kinds of castings weighing from 4 lb. each up to 720 lb. each, with a total weight of 20,565 lb,, went through the annealing process. The heat was turned on at 3:30 p.m., and the temperature was 1,640 deg. F. at 4:30 a.m. the next day. This temperature was then held until 8:30 a.m., the power being turned off at 7 a.m., stored heat maintaining the temperature from 7 to 8:30 o'clock.

This furnace has a demand of 274 kw. and during the above run used 3,680 kw.-hr., showing an average figure of 5.4 lb. of metal treated per kilowatt-hour.



Jack arms weighing 3,160 lb. each for electric shovels of Utah Copper Company annealed in electric furnace (*left*) . Charge of 20,565 lb. of miscellaneous castings loaded on car ready for furnace (*right*).

The outstanding advantages noted by the American Foundry & Machine Company in electric furnace operation are in the uniformity of the product, which on the test bars shows a greater reduction of area and a great tensile strength, elimination of scale from the castings, and a saving in labor.

Building Load at a *Net Profit*

By BERKELEY SNOW
Northwest Editor, Electrical West, Portland.

WITH the doubling of its gross merchandising business in 1928 and the recording of a substantial profit therefrom, the Pacific Power & Light Company, Portland, believes it is on the way to a solution of the problem as to how best to build domestic load. In its simplest terms, the problem with the company is: That an increase in domestic load at no cost is desirable; that the way to eliminate cost is to produce a profit in its merchandising department; and that merchandising operations will yield a net profit only when volume is secured. In short, the company having set out to merchandise to build load, the problem resolves itself into how to secure volume.

PACIFIC Power & Light Company shows gross sales of $750,000 for 1928, or $17.40 per residential meter. Net profit is treble best previous year. Average domestic consumption increases from 322 to 902 kw.-hr. as result of well-planned comprehensive merchandising program. Company uses approximately one regular sales employee per thousand domestic meters, with every employee co-operating.

When measured against results obtained in any year since the establishment of a merchandising sales department in 1922, the year's gross of $750,000 (December estimated) is an outstanding achievement. This is more than double last year's gross, which was the highest to date, and, after a liberal allowance provided by the company's bookkeeping system for expenses incident to the merchandising business, including interest on the capital tied up in the merchandising department, will yield a net profit more than treble the most profitable year to date, thereby indicating that an adequate net is dependent on volume.

To give an idea of the growth of the company's merchandising business it should be stated that the gross sales in 1922, the first year after the establishment of the merchandising sales department, were $117,000. The growth thus recorded in the past six years does not represent entirely a corresponding growth in volume of sales per customer on account of the expansion of the company's system during that period, but the 1928 record, which amounts to $17.40 per customer, as compared to the next previous high record of $9.35 per customer, is large enough to indicate that the problem of securing volume over the widely scattered and sparsely settled territory of the company is being solved. According to V. H. Moon, merchandise manager, who has headed the department since its inception, the answer is to be found in trained man-power working on a definite and well laid plan, embracing a complete line of appliances so that the year's work can be properly rounded out.

BUILDING A MERCHANDISING ORGANIZATION FOR VOLUME

The company serves over 100 cities, towns and rural communities in Oregon, Washington and Idaho, divided into nineteen districts. These range in size from the Yakima, Wash., district having 9,560 residence customers, to the Goldendale, Wash., district with 433. Each district comprises, besides the headquarters town, the smaller towns and the rural communities surrounding it. A district manager resides in each headquarters town, and maintains an office and operating force sufficient to handle the needs of his district. In many instances a local agent is stationed in the smaller communities within the district.

In the early attempts to carry on a comprehensive merchandising program all sales were entrusted to the regular operating crews. District manager, chief clerk, office help, line foreman, lineman, service man and groundman were all encouraged particularly to take an active part in campaigns, and actually to do the selling, partly on their own time, through special bonus inducements, and partly on company time by postponing the less necessary work of their regular jobs. Later full time salesmen or combination sales and service men were put on in the larger districts, and gradually from this stage has the practice been expanded until there are now one or more full-time salesmen employed in all but five of the smaller districts. In addition, the local agents referred to above are chosen with the idea that they shall spend part time on sales work.

DISTRIBUTION OF SALES FORCE

On a certain recent date there were a total of 35 men and ten women regular members of the sales force operating in fourteen of the districts, or an average of approximately one sales employee per 1,000 domestic meters. In addition, two sales supervisors were responsible for an equal division of the company's territory in which their time was divided between those districts most needing such supervision. This sales organization is not considered permanent or perfect, but will be subject to revision from time to time as the needs of the department manifest themselves, and as the needs of a particular district are found to be inadequately met. Believing that no district is too small to support at least one salesman and that some of the districts now are undermanned, Mr. Moon expects to increase his organization to about 60 men and fifteen women, tentatively figuring on maintaining one sales employee to about 500 or 600 customers.

In general, the women are utilized as store clerks and demonstrators, while the men are outside salesmen, working from the company's growing prospect list which is currently kept up to date. All salesmen work on the entire line, specializing in one or more appliances at different times during the year when those appliances are being campaigned. The only exception to this rule is that in some of the larger districts refrigeration specialists may be employed during a portion of the year. It is interesting to note that all salesmen, men and women, work on a straight salary, which is based on the individual's record and performance with the company. It would seem that the essence of the success of selling by such an organization would be in the personal element involved, i. e., the problem of securing the proper type of salesman. According to Mr. Moon this is indeed the case, but by extreme care in selection and by careful watching and supervision this problem can be solved, and in fact, the results of last year's work, as particularly exemplified in the fall washer and ironer campaign presently to be referred to, seem to bear out his contention.

With a sales force of this relative magnitude, it will

A Record Washer and Ironer Campaign

PERIODIC campaigns form an important part of the merchandising program of the Pacific Power & Light Company. In its recent fall campaign on Thor washers and ironers the company sold 973 washing machines and 483 ironers, establishing new national records on both of these appliances. Total sales in this campaign amounted to $157,484.25 in six weeks or $3.66 for each of the company's 43,000 residential meters. Two districts sold over $10 per customer. One salesman set an individual record with $9,306.25 for the duration of the campaign. The accompanying pictures show two of the window displays used during the campaign as well as the interior of one of the district offices. Samples of some of the advertising material used are also shown.

be recognized that a comprehensive plan for merchandising seaonable lines throughout the year is essential. With this in view the company sets up a schedule of major and minor campaigns well in advance so that the sales force is continually concentrating on the devices most readily saleable during certain seasons of the year. The company's 1928 schedule embraced the following major appliance campaigns:

March, washers and ironers.
April, cleaners.
April to August, refrigerators.
May to July, ranges.
Sept. 15 to Nov. 1, washers and ironers.
November and December, radio and ranges.

These campaigns were carried on by intensive selling outside the store backed by newspaper and direct-mail advertising, window trimming and store demonstration, all properly synchronized. Prize money to individuals and districts was offered, and district competition was organized and stimulated by setting up the campaign as a game or a race or other competitive event. In addition, minor effort, in the form of window display, store demonstration and store selling, was applied to cookers, heaters, waffle irons, percolators and toasters, tying in with the national plan of selling these items during certain months. Further, a complete line of all small and large appliances and lamps is carried in stock and displayed in the company stores, and the store salesmen work on these items throughout the year. Domestic water systems are also carried and sold in those districts in which there is a market for such devices.

Record of 1928 Sales

While final and complete figures on the number of each of the appliances sold during 1928 are not available at this early date, a partial list of the sales helping to make up the gross of $750,000, with December sales estimated, is as follows:

Washers	1,800
Ironers	600
Cleaners	700
Ranges	850
Refrigerators	335

In connection with these figures it is interesting to note that the plans for 1929 contemplate raising the quota to $1,000,000, or approximately $23 per customer. Following is the amount of time to be devoted to campaigns on the major appliances during the year and the number of those appliances set up as a quota to be sold:

Washers	2½ months	1,800
Ironers	2½ months	1,000
Cleaners	1 month	750
Ranges	3 months	1,500
Refrigerators	3 months	800
Radios	2½ months	500

A Record Campaign

Some of these campaigns will overlap each other, and interspersed between them and concurrently with them will be minor efforts on small appliances. Telechron clocks are to be added to the line and special effort will be applied to this device during the year.

As an example of the results that are possible under the company's system of campaigning, a word should be said about the recent fall campaign on Thor washers and ironers, of which E. N. Hurley, Jr., president, Electric Household Appliance Company, Chicago, said, "The campaign establishes new national records in washers per meter, also in total number of ironers sold in any campaign, and in ironers sold per meter." During this campaign 973 washers and 483 ironers, amounting to $157,484.23, were sold in six weeks to the company's 43,000 residence customers, equaling an average of $3.66 per customer. Two districts sold over $10 per customer, the Sherman district being high with $12.58 per customer, or more volume on two items in six weeks than the average merchandising utility company in the United States does on its complete line in an entire year. Some excellent individual sales records were also hung up during the campaign, one salesman selling 60 washers and 27 ironers for a total of $9,306.25, and another, 48 washers and 21 ironers for $8,145.90. The other five individual leaders were not far behind.

The merchandise offered during the campaign was the new Thor No. 2 agitator washer, the new Thor No. 0 rotary iron, which is interchangeable with the wringer on the washing machine, and the No. 10 ironer, which is used on a table. The theme of the campaign with this equipment was, "A Complete Home Laundry for only $1 down," and, "Now—a complete home laundry costs no more than the average washer alone." Speed of operation was also stressed in the advertising. Newspapers and direct mail were used to bring these messages and an elaboration of them before the customers.

In essentials the campaign was little different from former campaigns. District quotas were established, prizes offered, and a 2 per cent commission was paid to employees outside the regular sales force for prospects later sold during the campaign. Competition between districts was fostered by setting up the campaign as an air race. The names of commercial planes were assigned to districts and a circuit was routed on a map of the United States, once around which constituted reaching quota. Daily "Air News" bulletins made possible the plotting of the progress of the race by "flight masters" (district managers) on their maps, while "Pilot's Luck" bulletins issued periodically kept the "pilots" (salesmen) in touch with their progress toward the individual prizes. All districts except one exceeded their quotas which were parctically double those established in previous years. The final total for all districts was the sale of 154 per cent of the total quota. Well dressed stores and store windows, store and home demonstrations, and special advertising stunts contributed to the success of the campaign.

Increase in Kw.-hr. per Customer

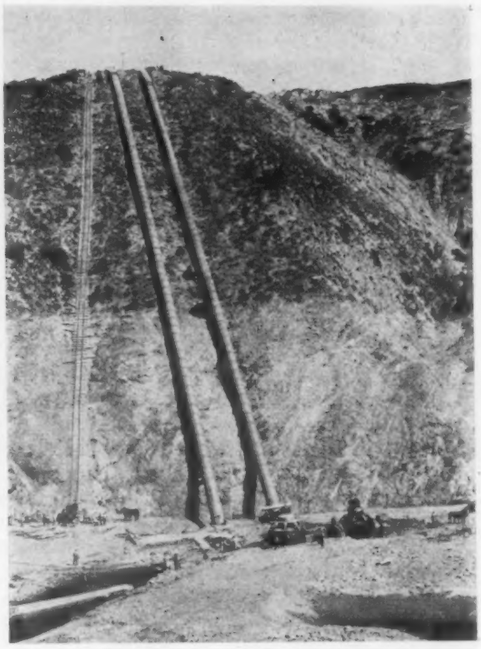
As a corollary to this story of success in building load at a profit, it should be shown that load actually has been built. In the year 1921, just prior to the establishment of the merchandise sales department, the average annual use among the company's residential customers was 322 kw.-hr. The latest 1928 figures available, as of Oct. 31, show that this average consumption has now reached 902 kw.-hr., an increase which is credited largely to the company's merchandising activities during this period. Among the qualifying factors bearing on the significance of this figure it should be stated that the company has not been particularly aggressive in selling electric water heating, though the figure quoted does include some low-wattage flat rate water heating consumption. Neither has the company intensively exploited the electric range in six of its larger districts, containing practically one-half of its total residential customers, on account of the fact that it is unwilling to compete in this field with its own gas plants.

Reconstruction of

San Francisquito No 2 Power Plant*

By H. B. GARDETT[1] *and* A. R. ARLEDGE[2]

[1]Construction Engineer, Los Angeles Bureau of Power and Light. [2]Assistant Engineer, Los Angeles Bureau of Power and Light



Site of the San Francisquito No. 2 power house shortly after the disastrous flood showing the undamaged penstocks.

SAN FRANCISQUITO No. 2 power plant was built originally during the time of the threatened continued power shortage in 1919 and 1920 and was finished in what is believed record time for a plant of that capacity. Contracts for the hydraulic and electric equipment were awarded July 25, 1919, and the first of the two units was placed on the line July 6, 1920, slightly over eleven months later. Again in reconstructing the plant after the disastrous flood resulting from the failure of the St. Francis dam, similar speed was accomplished, but no record is claimed as there is no precedent by which to establish one. Although six weeks elapsed before transportation was resumed and the way was cleared for actual operations to begin in the field, the first unit was placed on the line July 13, 1928, three months after destruction of the plant, and the second unit was placed in operation Nov. 1, 1928, slightly more than seven months after the plant was destroyed.

IT IS seldom that any man or group of men is called upon to rebuild completely a power plant from the ground up, a plant that the same group had built in the first place. Men may be called upon to remodel, enlarge, or improve a plant they have built, but the experience of the construction division of the Los Angeles Bureau of Power and Light in rebuilding San Francisquito No. 2 plant, after the disastrous flood of March 13, 1928, is unique. Major R. R. Robertson, the resident engineer on the job in 1919 and 1920, was in charge of reconstruction, while 50 men of the crew of 250 in the field worked on the original project.

The hydro-electric development at San Francisquito Canyon was designed to utilize the head developed by the Los Angeles aqueduct from Owens River to Los Angeles. Approximately eighteen miles of waterway, made up of tunnels, penstocks, and two siphons, all designed for a maximum flow of 1,000 sec.-ft., are utilized in power generation in this area. A 940-ft. static head is employed at power house No. 1 which has a capacity of 75,000 kva. of which the last unit of 25,000 kva. was placed in operation during November, 1928.

Power house No. 2 with a capacity of 35,000 kva. is approximately 6½ miles below No. 1 plant. The St. Francis reservoir was about midway between these two stations. It was used for the storage of water which had already passed through No. 1 power house and which was not desired for use in No. 2 plant. Water released from the St. Francis reservoir for the aqueduct system was passed down San Francisquito Creek to the No. 2 plant, where such waters were combined with the discharge from the plant and again entered the aqueduct system. A half-mile tunnel leading away from the draft tubes of the turbine of No. 2 plant was employed for this purpose.

From the surge tank in the aqueduct system above power house No. 2, three belled, 7-ft. pipes lead to a valve chamber where the third pipe is blanked for a future peak-load unit in the plant below. Two penstocks, each 1,400 ft. long, 7 ft. in diameter at the upper end and tapering to 6 ft. at the bottom, carry the water to the two 20,500-hp. vertical reaction turbines operating under a static head of 540 ft. in the power house below. The lower portion of the penstock on the brow of the hill is laid on concrete piers, anchored to a ridge of schist of a harder texture than most of that in the vicinity. This harder dike extends across under the creek channel to the west side of the canyon. The foundation of the power house, situated in what was the bed of the creek, and the foundation of the generating units and lower pen-

* Abstracted from a paper before the Los Angeles Section of the American Society of Civil Engineers, Nov. 14, 1928.

stock anchors are in this bedrock. The generators of the two vertical units are located on a floor just above the ground level and are coupled to the turbines some 25 ft. below by an extension shaft. Below the waterwheels draft tubes of approximately 20 ft. of draft head extend to the tunnel seal and the water passes from them into the tunnel below. For protecting the power house located in the stream bed a diversion channel was built above the plant capable of carrying 10,000 sec.-ft. of possible flood with ample safety.

The original power house building was of reinforced concrete with structural steel columns and beams in certain partition walls and floors of the electric bay.

In addition to the two generator units the main equipment housed in the plant consisted of seven 4,667-kva., 6.6/110-kv. transformers weighing 30 tons each, eight 110-kv., 3-phase oil circuit breakers, two banks of electrolytic lightning arresters on the ground in the rear and a 100-ton crane of 36-ft. span. The high-tension conductors led out through the roof to a single tower in the yard and then to a tower high on the hill.

Destruction of the Plant

When the 125-ft. wall of water engulfed the plant the resultant boiling and eddying gouged out lakes 25 to 50 ft. deep and 500 ft. long and heaped up corresponding great gravel beds. A lake no doubt would have been gouged out at the turn where the power house stands if the foundations had not extended into bedrock. All of the camp and living quarters were swept away. All of the power house above ground, including the generator room floor, was destroyed, leaving only the foundation walls of the turbine room and the two generating units resting upon their foundation piers.

The diversion ditch above the plant filled and the upper portion of the concrete facing of the diversion dam was swept away, including the upper portion of a tunnel leading to the tailwater tunnel from this diversion dam which was built for the purpose of returning aqueduct waters to the tunnels when bypassing down the canyon from St. Francis reservoir. The destruction of the upper end of this tunnel allowed gravel to enter the tailwater tunnel to the extent of about 4,500 cu.yd. This gravel filled the tunnel and was distributed within a couple of feet below the arch on a gradient trailing out nearly a half-mile below.

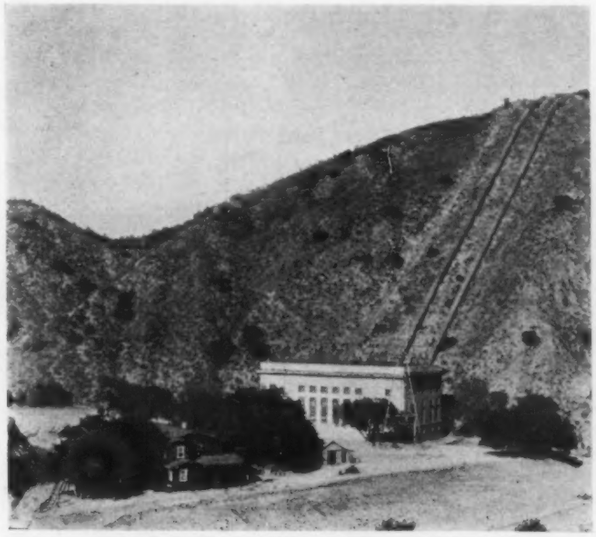
The two generator units, due to their sturdiness and weight and their firm foundation, stood the battering without the least deflection or movement. All of the extraneous appurtenances on the units were swept away and many of the minor parts broken or bent, leaving only the bare hulk of the machines. The penstocks on their concrete piers with their lower anchors in the bedrock also remained intact with but a few dents where they received terrific bumps.

This was all of the plant and equipment that remained in place. The broken parts of the walls, huge blocks of concrete, floor girders, bent steel beams, twisted pipe and conduit, oil circuit breakers, the seven transformers, the bridge girders and trolley of the crane were scattered and buried under a gravel bar extending in an arc below the plant site following what must have been a huge eddy. The only piece of equipment found a greater distance from the plant site was a boiler-plate transformer oil storage tank of 3,500-gal. capacity which had been beached about a mile below the power house. Three of the seven transformers were found sticking from the sand and the day after the flood capillary attraction brought oil to the surface betraying the location of the fourth a foot or two underground. The remaining three were found 12 or 15 ft. below the surface. The only transmission tower within the flooded area was wrenched from its footing stubs, which with their concrete footings were still in place.

Clean-up and Repair of Waterway

Since the main road up San Francisquito Canyon serving both power plants was completely destroyed, transportation was cut off both from Saugus below and from power plant No. 1 above. A transmission line road leading to the upper end of the penstock of No. 2 plant was utilized for hauling men back and forth and for bringing in the initial lot of materials and supplies. Taking a lead from the lumbermen's book, the men threw a greased skidway down the hill on the bed of the old penstock tramway. A gasoline hoist lowered a surprising amount of material down this skidway.

The first concern was to clear the tunnel and repair the breaks in the aqueduct below power house No. 2.



The original San Francisquito No. 2 plant prior to the failure of St. Francis dam on March 13, 1928. The clubhouse is in the foreground and the bypass ditch is at the extreme left of the picture.

The new San Francisquito No. 2 plant taken from approximately the same spot as the picture at the left. The scour lines on the canyon walls show that the plant was buried beneath 125 ft. of rushing water.

The gravel in the tunnel below the power house presented a serious problem. It was cleaned out by using a dragline on a double cable operated from the lower end. Dragline operation was assisted by the passage of water through the tunnel, and a sand trap at the lower end prevented the washings from entering the aqueduct system below. Thus operation of the aqueduct and of No. 1 plant was quickly resumed. These operations were carried on by a 24-hour shift with night lighting provided by small gasoline lighting sets. At the same time excavation was started in the turbine room of the power plant, a repair shop and construction buildings started, and work rushed on the road.

One of the seven transformers found buried in the debris below the power house. Some of the transformers were found buried at a depth of 21 ft.

Planning Reconstruction

While these initial operations were under way in the field the engineers in the Bureau's Los Angeles office were active planning, designing and purchasing. Consulting engineers examined the turbine-room walls and the foundation beneath and a method of treatment was determined. The east and north walls because of cracks were removed about half their depth, the slightly tipped west wall was tied to the whole by heavy reinforced concrete beams, and a heavy reinforced concrete floor slab with reinforced beams connecting the crane columns was placed. Thus the whole foundation was tied together solidly to receive the superstructure.

Since the plant originally was built the increasing tendency in station design has been to place switching and transformer equipment outdoors.

Consideration was given to this idea and comparative estimates were made. From these estimates it appeared that for this particular location and condition the economical plan was to reconstruct as nearly as practicable the original plant. However, such had been the progress in the art of circuit breaker design that it was necessary to redesign the structural steel of the electrical bay since the new circuit breakers would weigh considerably more than the original ones.

The exterior design was changed so as to allow the use of the "Keller process" or so-called "slip-form method" of building the concrete superstructure. While the diversion dam and ditch are rebuilt in the same plan as the original and to the same height and depth, they were made 50 per cent wider as an extreme precaution against possible floods. The present design will accommodate a flood of more than 16,000 sec.-ft.

At first it was believed possible to utilize the gravel pile and sand bars thrown up by eddying flood waters as concrete material for rebuilding. Careful inspection and test, however, proved that these materials were not satisfactory. It was not economical to haul rock from the San Fernando Valley gravel plant so that all coarse aggregate was quarried from granite formations above No. 1 power house. Sand was obtained partly from bars above the No. 1 plant and partly from the wider part of the canyon below No. 2 plant far enough down so that the flood stream had had a chance to sort the materials but not far enough so that the finer and lighter stuff had a chance to deposit.

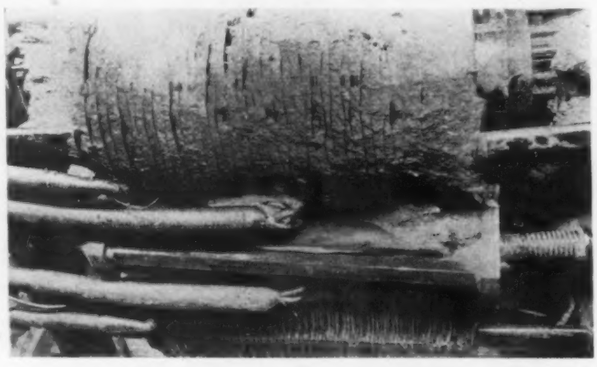
Salvage and Repair of Equipment

An attempt was made before excavating equipment could be spared from more pressing excavations to sluice away the bars below the plant and thus expose the buried equipment. This was not highly successful, mainly because of the large amount of coarse material in the lower levels of the gravel bar. The major portion of the bar was turned over with crawler gas shovels and draglines. It was concluded early that the transformers were the main items of salvage from this deposit. While efforts were made to recover the crane this was beyond any possibility of salvage, except for a few minor parts. The 110-kv. oil circuit breakers were so badly damaged that no attempt was made to salvage them.

A special shop building was erected on the ground for the repair of the transformers. An oven was built to bake the cores and coils. Such was the rugged construction of these transformers that the condition of the coils and cores was a surprise to everyone. New bushings were required, some new cast-iron covers were necessary, a few new Herkolite tubes installed and the trucks repaired.

One of the duplicate 110,000-volt circuits between the two power plants was used to transmit 6,600-volt service from this station to the No. 2 power house site for the purpose of supplying construction power. Provision was made for restoring this line to its normal use in case of emergency and especially during the daily peak load.

Desire to hasten the building operation so as to get the crane working as soon as possible resulted in a decision to adopt the "Keller process" of "slip-form" construction. In this type of construction a band of approximately 4 ft. of forms is made for all the walls throughout the building. These are jacked up gradually under a continuous pour by use of yokes and special



One of the transformer coils removed from the shell. With minor repairs these transformers were put back in service after thorough cleaning and baking.

jacks anchored to 1-in. special carbon steel rods placed at fixed intervals throughout the building walls and resting on the foundation.

Runways for delivering the concrete were laid on the yokes and went right up with the form. Working the crews in 12-hour shifts, a continuous pour went on in regular rotation about the building, the pour being followed by the jacking up of the form at stated time intervals. The amount of raise determined by a yardstick indicator fastened to the anchor rod and yoke was from ¼ to ⅜ in. and the total movement averaged approximately 3 in. per hour.

Considerable anxiety attaches to this type of construction. There must be nothing forgotten that goes into the walls, and pipe men, conduit men, electricians, reinforcement men, and all connected with the work must be alert. This latter fact is one of the strongest reasons for advocating this method of building. It produces a fine morale, cuts out delay and thus its very speed fosters economy.

The building was poured to its fire wall in nine days from the start of the first pouring. The only real trouble encountered was in applying the coloring and water-proofing paint. The oil used on the forms for preservation and slippage gave some trouble.

Original housing facilities to care for the operating forces, their families, and transient workmen and guests, consisted of eleven bungalows, a club house, and a school house, with garages for the accommodation of personal and department cars. These, with their lighting system, sewage disposal system, domestic water line and high pressure water line for fire protection were scattered in various places where flats beside the stream afforded protection from ordinary flood and were located largely to take advantage of grown native trees. All of these buildings were totally destroyed.

In replacing this camp there was no fit topography near the stream nor any trees by which to determine the new location. Consequently the cottages and clubhouse have been grouped in one side draw and the school house in another. Trees and shrubbery will be planted to make the living quarters attractive.

Late in the spring when the splintered and twisted stumps of some of the trees that were still left rooted began to sprout, a tree surgeon was borrowed from the Los Angeles Park Department and put to work in an effort to encourage rapid second-growth trees from all rooted stumps. When grading about the power house is completed the entire area will be landscaped under the direction of the park department. It is believed that in time these efforts will heal the grievous wounds to the scenery that resulted from the disastrous flood.

Rebuilding Two 17,500-kva. Generating Units Under *Emergency* Conditions

By A. C. WINGO *and* C. M. ALLEN*

THE SALVAGE and reconditioning of the two 17,500-kva. hydro-electric generating units in the San Francisquito No. 2 power plant of the Los Angeles Bureau of Power and Light presented problems in many ways unique in electrical history. As reported in ELECTRICAL WEST of April 1, 1928, this power plant was completely demolished incident to the failure of the St. Francis dam. Since the general details pertaining to the reconstruction of this power plant are dealt with fully in another article elsewhere in this issue, only the salvage and reconditioning of the major electrical equipment will be considered in the following.

Physical arrangement of the plant was such that the No. 2 generating unit was at the upstream end of the power house building thus bearing the full impact incident to the collapse of the power house building when struck by the 125-ft. wall of water. In addition to this, the No. 2 unit was running at the time of the disaster and continued to run for some three hours under water and partially buried in sand, gravel and debris until the butterfly valve at the upper end of the penstock could be closed by hand.

Detailed examination and inspection showed that the No. 2 unit had been damaged to the extent of a burned out and completely destroyed thrust bearing, the collapse of which allowed the entire 72-ton rotor to settle approximately 1 in., thus causing the waterwheel runner to ride directly on the throat ring attached to the top of the draft tube. When the machine was taken down the parts were found to be somewhat fused together. Stator laminations were badly worn due to the rock-crusher action during the time that the unit was running under water with sand and gravel passing through it. This abrasive action resulted in the wearing down of the wedge slots to such an extent that the wedge bearing was reduced fully half. Field coils were battered and worn to such an extent that all turns on the pole pieces were completely short-circuited. Exposed sections of the stator coils were literally ground to shreds, necessitating a complete rewind job. The exciter was damaged to an extent requiring a complete rebuilding job and the main shaft of the generating unit was badly abraded and sprung both above and below the rotor. Of course, the turbine itself was damaged, but considering the hard usage which it suffered the waterwheel repairs were comparatively simple and not extensive.

Fortunately the stator frame, upper guide frame and thrust-bearing spider frame were not damaged, thus furnishing a basis upon which to begin reconstruction.

* Junior electrical engineers, generating construction division, Bureau of Power and Light, City of Los Angeles.

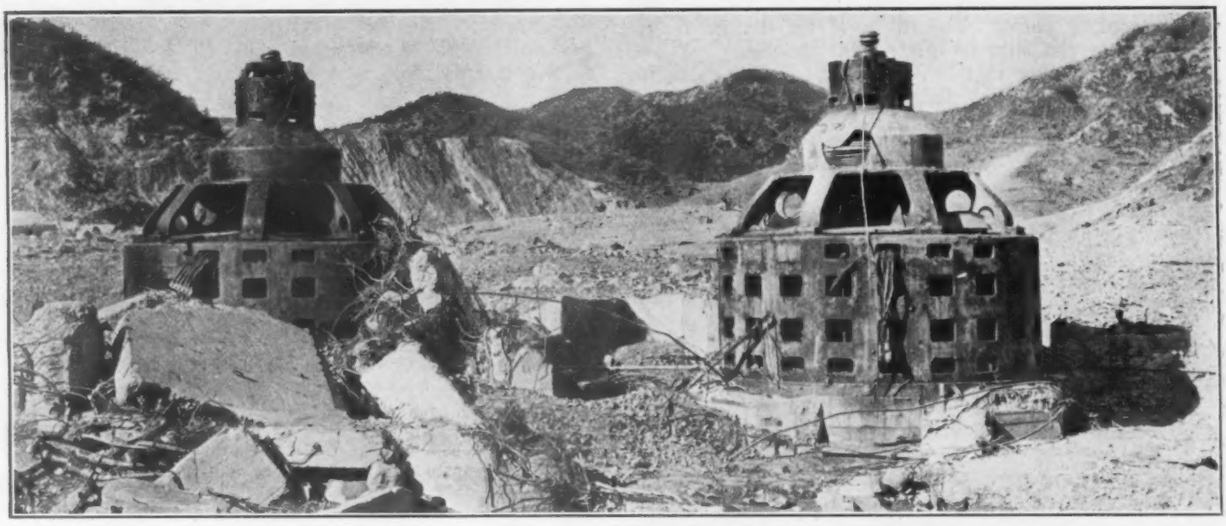
In the reconstruction of the generator itself it was possible to salvage by cleaning, straightening, and rolling, approximately 50 per cent of the 44.5 tons (60,000 punchings) of laminations from the damaged machine. The salvaged laminations were alternated between layers of the new "iron" which was needed to complete the job. This scattering of the partially damaged material made it unnecessary to re-shellac the salvaged laminations.

Heavy and rugged construction of the field coils was the only thing that kept them from complete destruction. As it was they were so badly damaged that they needed to be completely rebuilt, and since they weighed only about two tons each, they were transported to the bureau's shops in Los Angeles. The field coils were first boiled in a solution of Okite "railroad cleaner" to cut the old shellac and loosen the old insulation between turns. After the copper had been cleaned and the damaged corners filed and trued, shellac was applied between turns and allowed to dry, subsequently supplemented by long-fiber manila paper of 10-mil thickness. After reassembly the field windings were placed under a heavy pressure in a specially designed frame and baked for several hours at a temperature of 120 deg. C. This process resulted in a good, strong job both from a mechanical and an electrical standpoint.

After repairing, a weight check of the pole pieces showed a range in weight from 4,200 to 4,400 lb. each. Consideration was given to this disparity in weight when assembling the rotor in order to obtain as nearly as possible a perfect balance. Finally it was necessary to introduce a 47-lb. counter-weight on the rotor. Smooth operation of the machine after it was placed back in service proved that the balancing process was satisfactory.

The stator rewinding job was practically the only clean-cut repair work incident to the entire task. Since the old stator coils were very badly damaged they were stripped out and junked and replaced by a complete new set of coils purchased for that purpose. These coils were tested in place as they were assembled to obviate any possibility of having to tear down the windings after completion of assembly. The machine was completely rewound and ready for lowering into place within seven days after the placing of the first coil, a noteworthy feat for a machine of this capacity. Dry-out of the stator was unnecessary as the coils were thoroughly dry when received from the factory and were heated to a temperature of 55 deg. C before placing them in the stator.

The most serious problem presented was that of straightening and otherwise reconditioning the main shaft of the generator unit. This shaft varies in diameter from 14 to 20 in. with an over-all length of 21 ft. 3½ in. with a laminated spider 8 ft. 6 in. in diameter and 5 ft. 6 in. in thickness shrunk in place. This shaft extends 5 ft. above the rotor and 8 ft. below the rotor and had a deflection amounting to 0.110 in. above the rotor and 0.045 in. below the rotor with the starting point of the bend in each case about 10 in. from the rotor. The task of reconditioning the entire rotor assembly was done with equipment improvised right on the job. The special lathe equipment set up to care for this job involved a special nickel-chromium cast-iron ring placed around the rotor at each end to serve as chucks to carry the entire rotor assembly. These chuck rings rested on two 8-in. parallel shafts functioning as roller-bearings on which the entire assembly was rotated. One shaft acted as a driver and the other as an idler. A special machine tool was designed for turning the lower end of the shaft and for facing the coupling, while a standard lathe bed was used for the upper end.

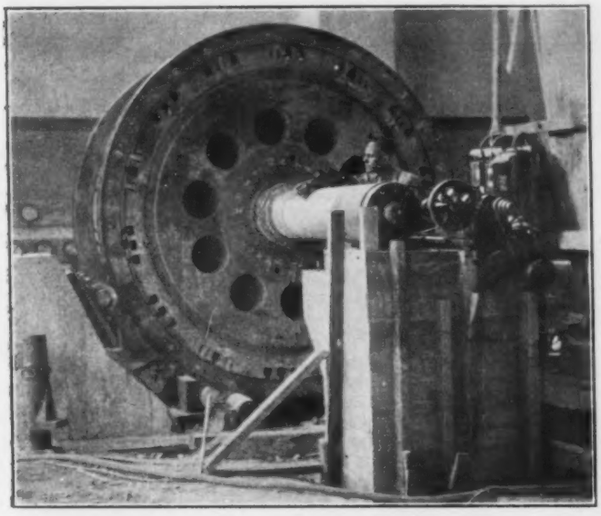


From this arose the new San Francisquito No. 2 power house in eight months.

Spot heating was used to straighten the shaft, the heat being applied by an acetylene heating flame on the convex side of the shaft. Results of this spot heating were very successful and the shaft was brought to within 0.002 in. of actual straightness. The shaft then was machined and a special lapping tool was used to secure a proper bearing surface. The upper and lower guide bearings were rebabbitted and rebored in the Los Angeles shops after the new shaft diameters were secured.

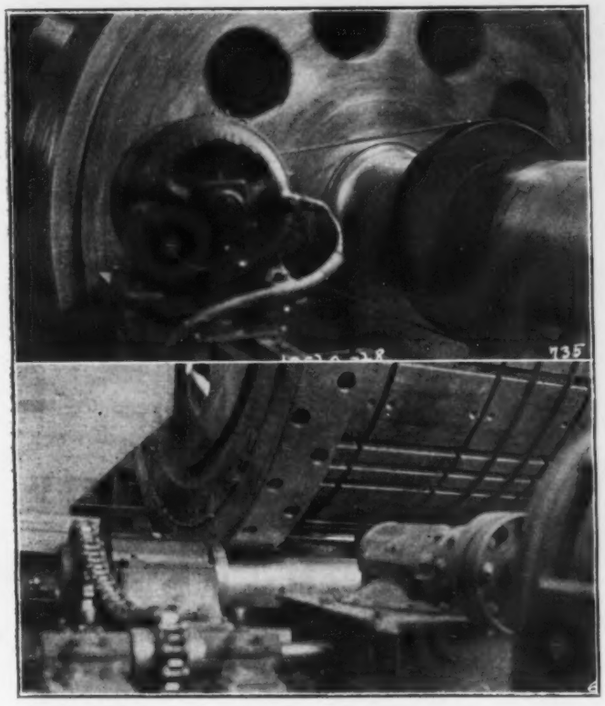
A complete new thrust bearing with copper cooling coils and new housing was installed to replace the damaged equipment. This new bearing is fitted with a

high-pressure pump connection to six points on the stationary bearing plate, which arrangement assures positive lubrication for quick starting. The turbine itself was completely overhauled and the runner wear-



Machining the exciter-end of the shaft with equipment rigged up on the job.

ing rings and plates were replaced with new parts. The lower shaft was redressed in the field and the turbine was then ready for assembly. It is of some interest to note here that the spare runner which was stored in



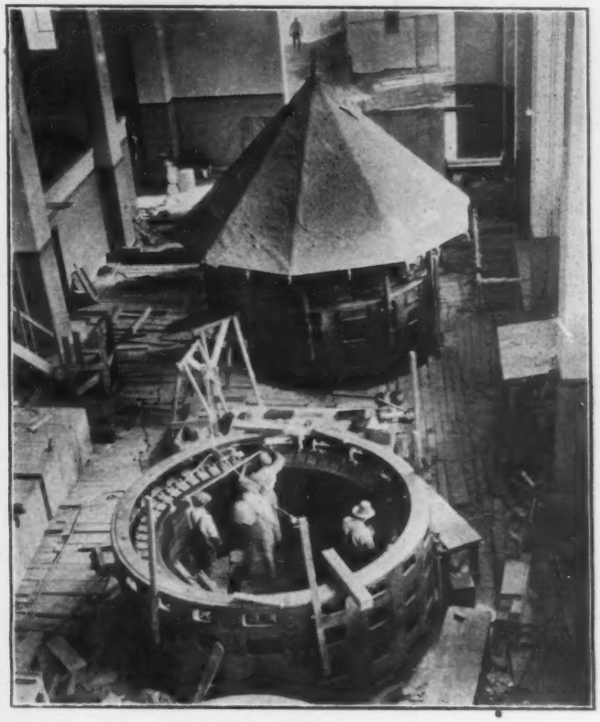
(*Below*) Special lapping tool in operation on the shaft. (*Above*) Rotor-revolving mechanism.

the turbine room of the old power house and which was leaning against the south wall in the southeast corner of the turbine room had weathered all the destructive commotion without damage. It merely had been rolled to the southwest corner of the building and still was leaning against the south wall.

No. 1 unit which was shut down at the time of the flood was practically uninjured from a mechanical standpoint and suffered only from inundation and a deposit of dirt and debris in it. Consequently it was possible to overhaul this unit and restore it to service by June 14, 1928, just three months and one day following the disaster. The waterwheel wicket gate, Johnson valve and other related equipment remained intact because they were protected by the enclosing foundation. Even some of the oil-gage glasses were unbroken.

The stator of this unit was jacked up, cleaned and the windings gone over carefully to strengthen any weak or damaged places in the insulation. The exciter was removed from the top of the shaft and a motor-driven exciter installed in its place. This motor-driven exciter was retrieved from the mud in the bottom of the turbine room to which point it had been swept upon collapse of the generator room floor. The installation of a new synchronous motor-driven governor, which was delivered by the manufacturer six weeks after the placing of the order, completed the repairs of the units to the point at which dry-out could start.

Since the generator had suffered such a complete soaking, during which time water had evidently floated



New generator-room floor showing the partially assembled No. 2 unit in the foreground and the No. 1 unit in the background with its "roof" which protected it first from the elements and then from construction debrirs.

into the insulation between turns, it was necessary to impress into service electric heaters and hot air blowers for the preliminary dryout to remove the dead short-circuit between turns. Subsequently the machine was put on dry-out in the usual way.

The plant was completely rebuilt and restored to service by November, 1928, and it is desired to acknowledge here the high degree of sympathetic co-operation accorded by the manufacturers and by the entire personnel engaged in the reconstruction work.

Engineering Practice

High Transmission Crossing Built Over Vancouver Harbor

Single Tower Line Provides for Two 165-Kv. Circuits, Four 34.6-Kv. Circuits and Four Communication Circuits With 186-Ft. Minimum High Water Clearance

By A. VILSTRUP, British Columbia Electric Railway Company, Ltd., Vancouver, B. C.

THE new transmission crossing of the British Columbia Electric Railway Company, Ltd., across the upper arm of Vancouver harbor, carries two 34.6-kv. transmission circuits and two telephone communication circuits and provides space for future construction to the extent of two 165-kv. circuits, two 34.6-kv. circuits and two telephone circuits. This crossing was built at the Second Narrows of Burrand Inlet near the older structure which it supersedes and will form an important link in the company's Bridge River hydro-generation and transmission projects.

The earliest transmission line crossing at the Second Narrows of Burrard Inlet was built about 1905 when the company extended its railway and power operations to the North Vancouver district. This early crossing consisted of very tall, single-wood-pole structures carrying two three-phase, 20-kv. circuits which subsequently were changed over to 34.6 kv. As certain types of ships with tall masts began to use the upper portion of Vancouver harbor the clearance between water surface and transmission conductors was found to be insufficient. In consequence of this interference with navigation a second crossing was built during the winter of 1913-14 at a point slightly east of the original crossing. The structures of this second crossing also were of a temporary nature, double-wood-pole "H" structures carrying the same number of circuits as the older crossing, two 34.6-kv. transmission circuits and a telephone circuit. All of the eight conductors used in this crossing were ½-in. stranded galvanized steel cable originally strung with a clearance of 164 ft. to high water surface of the fairway below but later tightened up to provide 174-ft. minimum clearance. This second crossing remained in service until March 25, 1928, at which time the new permanent transmission line crossing was placed in operation.

Several special features had to be given consideration incident to the design and construction of the new crossing. In the first place, channel dredging at the site of the main H-frame structure on the north shore to remove the shoal on which it stood compelled the company to proceed with the building of the new crossing sooner than otherwise intended. In the second place, the privilege of erecting a permanent steel tower on the right-of-way of the Canadian Pacific Railway along the south shore, replacing the temporary H-frame structure, could not be obtained. This necessitated locating the south shore structure an appreciable distance inshore and at a higher elevation. In the third place, the development of the company's newly acquired water rights on the Bridge River was undertaken shortly before the removal of the second crossing and its structure was ordered. Since the projected development contemplated bringing the first two high-tension transmission circuits from Bridge River into Vancouver by way of Squamish and North Vancouver, the design of the present new (third) crossing structures was laid out to permit the subsequent addition of two 165-kv. circuits. In the fourth place, possible industrial development in the North Vancouver city and district seemed to warrant building the crossing structures to accommodate a 100 per cent increase in local transmission lines and in private telephone circuits. In the fifth place, a minimum clearance of 186 ft. from the lowest of the conductors to the surface of the water at high tide level was stipulated by harbor authorities.

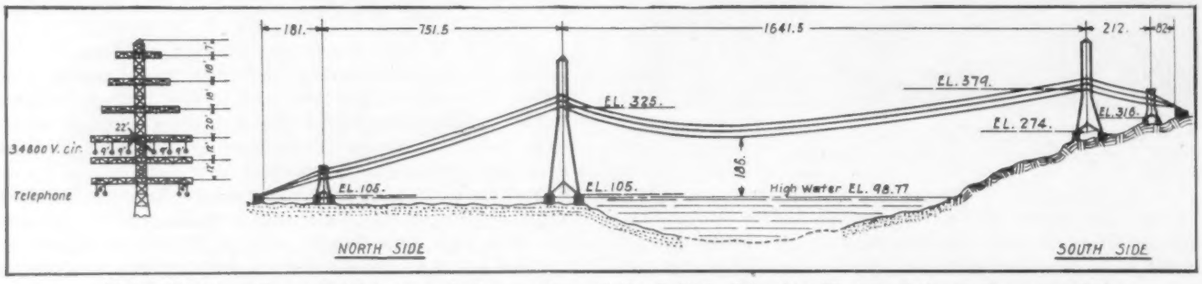
All of the foregoing conditions, together with the conspicuous location of the high crossing towers in the main harbor of Vancouver, influenced the design and construction of the towers. The matter of general appearance was considered to be important, especially since the tops of the two main towers reach an elevation well above 300 ft. from the surface of the inlet.

The upper portions of each of the two main suspension towers are exactly alike, but the 311-ft. north shore tower is 115 ft. taller than the south shore tower. The latter stands on higher ground with its base 169 ft. higher than the base of the north shore tower. Cross-arm spacings, span lengths, elevations and similar information are given in the accompanying profile of the crossing.

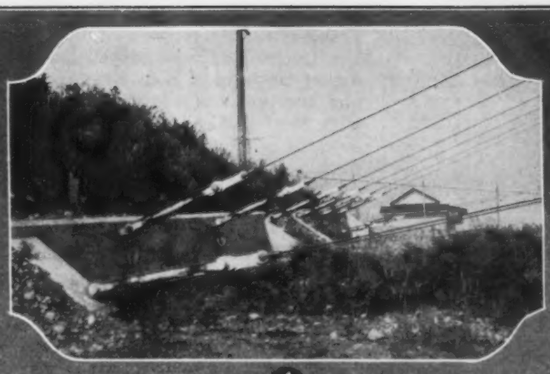
Foundation conditions at the south shore were favorable for the construction of tower footings, but the north shore foundations were much more difficult because the natural surface of the ground was under water at high tide. At the north shore the tower foundation had to be built in a bed of gravel which extended to an appreciable depth requiring a sheet piling cofferdam backfilled with sand and gravel around each footing.

Tower foundations were designed in the form of four separate tiers per tower, all tied together above the surface by means of structural steel members. The tower legs are extended into the piers, these extensions being substantial structural members assembled in the form of pyramid bracing connecting to steel grillage to distribute the stresses.

For the piers of the suspension tower at the north shore, cedar piling was driven to a depth of approximately 20 ft. below the floor of the excavation. A



Major details of Burrard Inlet transmission crossing of the British Columbia Electric Railway Company, Ltd.



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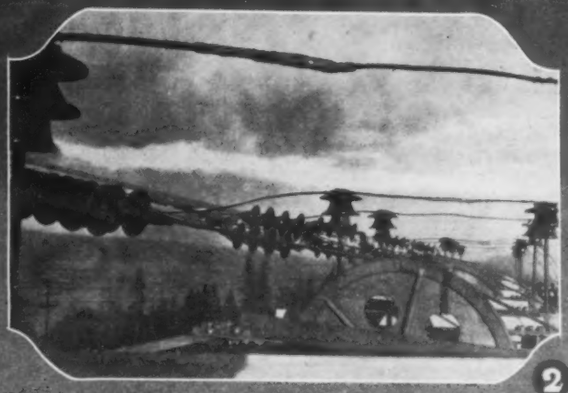

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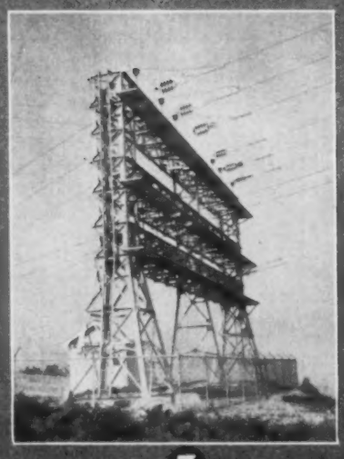

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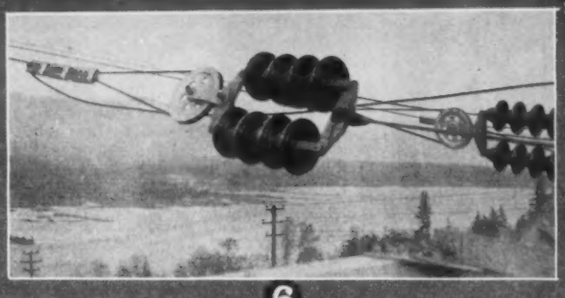

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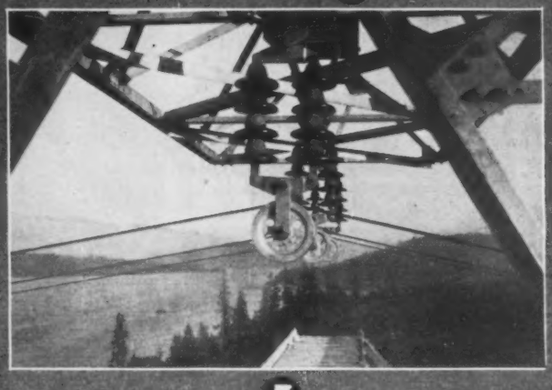

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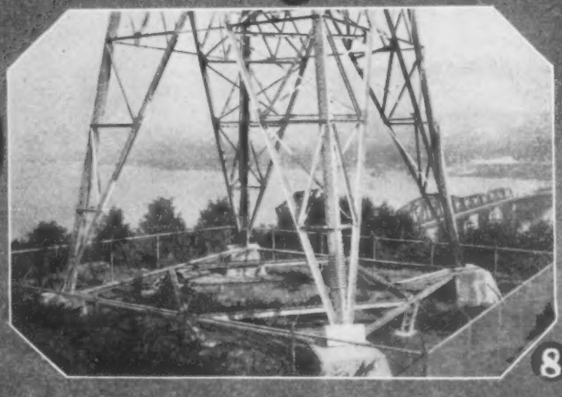

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High Crossing Span

ATTACHMENT of back-guys to anchors with turnbuckles provides tension adjustment for each conductor (1). (2) Construction at top of anchor tower over which back-guys ride on large sheaves. Long pins on pin-type insulators obviate troubles from birds roosting between lines on take-off. Wrapped and soldered joints between Copperweld and copper conductors also are shown. (3) General view of anchor tower. Walkways facilitate construction and maintenance. (4) Main 311-ft. suspension tower. Footings are 62 ft. apart on centers. One of the old towers may be seen in the background. (5) One of the main crossarms, 58 ft. long, with permanent walkway. Removable stanchions used to support rope railing when work is being done. (6) Strain insulator assembly details. (7) Suspension assembly is economical in vertical space requirements. Upper yoke is mounted on special U-bolt and is free to swing in all directions. (8) Base of south shore suspension tower.

concrete seal 5 ft. thick was placed in the bottom of the cofferdam to exclude salt water during construction of the concrete pier. The weight of this seal was not included in the calculations for uplift. The depth of the concrete pedestal proper was 27 ft., making the total depth of the foundation, including the piling, 52 ft.

In the construction of the towers all joints and splices were bolted using ¾ and ⅞-in. bolts. A steel spring cup washer was used under each nut and after the final tightening the thread of the bolt was checked to prevent movement of the nut due to vibration. More than 30,000 pieces of steel, all heavily galvanized and totaling approximately 408.5 tons, together with approximately 180,000 bolts, were used in the four towers.

Unit stresses and other fundamental conditions affecting the design of the tower structures were based upon the requirements of the specifications of the Canadian Engineering Standards Association for railway bridges. The arrangement adopted for supporting the conductors imposes the following maximum conditions of loading upon the suspension towers:

1. A 5,000-lb. vertical downward thrust at each conductor and ground-wire support.
2. A 2,000-lb. horizontal pull normal to the line of the conductors at each conductor and ground-wire support.
3. A 7,600-lb. horizontal pull in the direction of the line at each of any three conductors, or ground-wire supports.
4. Wind load on the tower itself of 20 lb. per sq.ft. acting in a horizontal direction and based upon 1.5 times the exposed area of any face.
5. A combination of all of the foregoing loads.

Corresponding maximum loading conditions are imposed on the anchor towers as follows:

1. A 3,000-lb. vertical downward thrust at each conductor attached to the lowest crossarms.
2. A 4,000-lb. vertical downward thrust at each conductor attached to the middle and top crossarms.
3. A 1,500-lb. horizontal pull in a direction normal to the line of the conductors at each conductor support.
4. A 7,600-lb. horizontal pull in the direction of the line at each of any three conductor supports.
5. A 10,000-lb. horizontal pull in the direction of the line at any one conductor support.
6. Wind load on the tower itself of 13 lb. per sq.ft. based upon 1.5 times the exposed area of any face.
7. A combination of all of the foregoing loads.

These conditions are based upon the assumption of a maximum wind and ice loading as produced by wind at 60 miles per hour with ½-in. coating of ice on the conductors at 0 deg. F.

Maximum uplift on the two suspension towers resulting from the assumed conditions is 183,500 lb. for the south tower and 150,000 lb. for the north tower. This uplift with a 50-per-cent margin is taken care of by the weight of the reinforced concrete foundations provided for the towers.

Crossarms in these suspension towers are of trapezoidal box shape in section and the upper side of each is covered with steel plates to provide convenient working platforms. Access to the upper portion of the tower and crossarms in each case is by means of a steel ladder attached to one leg of the tower and provided with convenient rest platforms and terminating at a steel platform located inside the tower below the lowest crossarm. From this platform to the top and connecting with the various crossarms the ladder is carried inside the tower for convenience and safety.

Inshore from each of the main towers is a reinforced concrete anchorage partly buried in the ground and between this anchorage and the main suspension tower in each case is an anchor tower. The purpose of the anchor tower is to provide a separating point and provide a take-off. As now installed, the anchorages and anchor towers provide for all of the present and proposed lines with the exception of the two 165-kv. lines.

The conductors used for the crossing, both for the power and telephone circuits, are ⅝-in. stranded Copperweld steel which has a conductivity 40 per cent of copper and a guaranteed elastic limit of 11,400 lb. These conductors are dead-ended on the water side of each anchor tower and the stresses are transferred by means of stranded Copperweld steel guy cables to suitable fastenings attached to the anchorage. Construction details are shown accurately in accompanying illustrations.

Permanent working platforms are conveniently located along the face of each anchor tower from which the insulators, yokes and clamps may be reached and inspected. Steel wire-rope sockets are used for attaching the back-guys both to the strain insulator yoke and to the achorage fittings. The latter fittings include a turnbuckle at each anchorage for fine adjustment of the sag in each individual conductor.

In the suspension towers each conductor is supported by a double yoke and insulator assembly with a 14-in. diameter sheave hanging flexibly suspended from the underside of the crossarm. Physically these assemblies are similar to those used at the anchor towers. At the peak of each suspension tower a large sheave has been mounted to support a proposed ground wire which will be installed at the time the 165-kv. Bridge River circuits are installed.

Foundation and anchorages were built by Stewart & Barber, contractors of Vancouver, B. C. The design, manufacture and erection of the tower structures were carried on by the Canadian Bridge Company, Ltd., of Walkerville, Ontario. Stringing of the conductors was undertaken by one of the company's regular line crews. The whole of the work on this crossing was carried out to completion without a serious mishap or accident of any kind.

A Safety-Panel for Steam-Plant Motors

Space is at a premium and simplicity of control a vital factor in the new Long Beach No. 3 steam plant of the Southern California Edison Company at Long Beach, Calif. The "dead-front" safety panel shown in the accompanying illustration is one of several that are used in the plant for the control of groups of four, six and eight motors. The panel shown controls four motors and contains a solenoid-operated contactor and a fused safety switch for each motor. Each unit is housed in a separate compartment. In the switch compartment the knife-blades of the switch are mounted directly on the door so that when the door is opened the switch also is opened exposing only the "dead" side of the switch and "killing" the fuse clips.

Most of the auxiliaries in the plant are motor-driven and most of the motors are for a.c. service and designed to start directly across the line. Therefore these motors lend themselves to push-button control which makes possible the installation of the contactors immediately adjacent to the motors regardless of the point from which the motor may be controlled.

The safety type of panel shown was developed by Edward Woodbury, electrical engineer of Stone & Webster, Inc., Los Angeles, in co-operation with the Diamond Electrical Manufacturing Company of Los Angeles.

Stubbing Clamp Adapted to Square Stubs

By R. E. CUNNINGHAM, Farnham & Cunningham, Los Angeles.

Where poles are in good condition above the ground line and particularly in rural areas where the load per mile is light at best, operating experience has proved the economic advantages of "stubbing." As pointed out in the report of the Overhead Systems Committee, P.C.E.A., on page 475 of Electrical West for May 15, 1928, "if the proper stubbing job can be done for $10 or $15 it is possible to get from ten to fifteen years' additional life out of the pole and under these conditions it would appear that it is the economical thing to do."

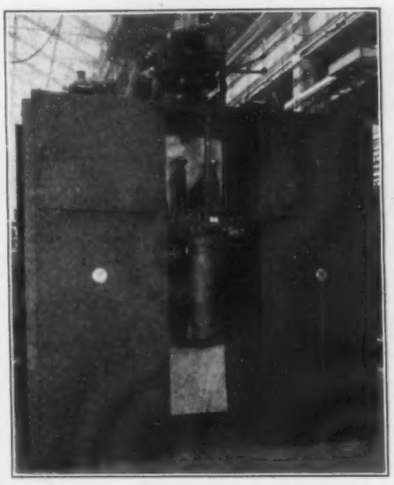
Section through round pole with square stub showing application of standard clamp through use of special shims.

Gradually the practice of anchoring stubs to poles by means of wrapping them with heavy wire is being displaced by the use of patented stubbing clamps. One of the newest of these stubbing clamps is the Samson clamp which also may be used for attaching square stubs to round poles. As shown in the accompanying illustration the two spacing shims mounted on the sides of these square stubs hold the clamping band in such a position that it may be tightened up in practically the same manner as if it were used on a round pole and a round stub.

Steel Structures for Circuit Breakers Replace Concrete

By E. K. READ, Circuit Breaker Engineer, Westinghouse Electric & Manufacturing Company.

In the accompanying illustration is shown an oil circuit breaker mounted in a fabricated steel structure designed to replace the reinforced concrete cells now commonly in use for oil circuit breaker mounting in substations. The circuit breaker and its mounting frame as shown are built complete at the factory thus reducing materially the time, materials and expense incident to its installation. The apparatus as shown is of unit construction and is shipped as a unit.



A steel-mounted circuit breaker unit designed to replace reinforced concrete cell mounting.

The steel structure is better suited for circuit breaker service than is the concrete structure because steel is able to absorb operating shocks with no damage to itself. Further, by obviating the use of reinforced concrete, all of the time and material-consuming work incident to the preparation of a reinforced concrete cell with its mounting inserts is saved. Taking advantage of the greater strength of steel frame, the space required for a given circuit breaker also may be reduced over that required by the same breaker mounted in concrete cells. The lighter weight of the all-steel unit also results in indirect saving in substation buildings because floors, beams and supporting columns can be made correspondingly lighter.

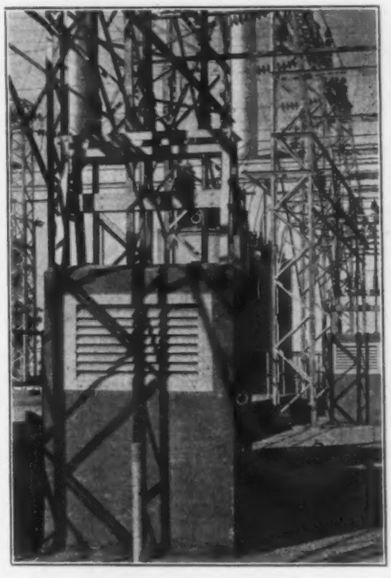
In the structure shown the circuit breaker only is supported. However, the use of steel can be extended to support the disconnecting switches and further yet to support the bus with corresponding saving.

Steam Plant Efficiency Increase Saves 5 Per Cent U.S. Coal—According to statistics released by the National Electric Light Association the conservation of the nation's coal supply through increased steam plant efficiency as compared with 1919 is 5 per cent of all coal used each year in the United States. In addition, there has been a greater saving through the use of electricity in factories.

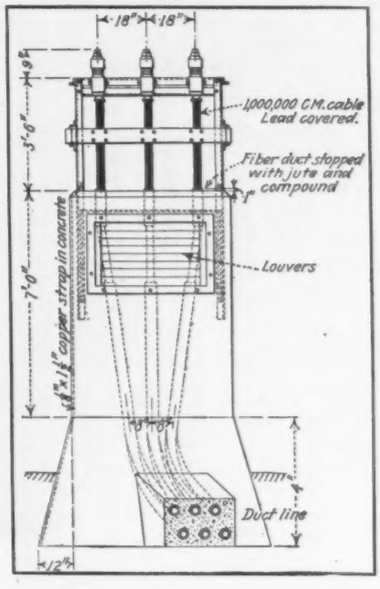
Support and Ventilator for Large Cables

Where 1,000,000-circ.mil cables are brought from the underground duct line up into the outdoor bus structure at its San Bernardino, Calif., substation, The Southern Sierras Power Company uses the type of cable riser illustrated herewith. The concrete riser structures are 7 ft. high above the ground line and provide at once physical support and mechanical protection for the heavy cables and corresponding potheads.

Duct line ventilation also is improved materially by the louvers provided on the sides of the riser structures. In the installation six 1,000,000-circ.mil cables (2 per phase) are accommodated.



Front elevation of ventilated concrete cable riser used at the San Bernardino substation of The Southern Sierras Power Company.



Installation of concrete cable risers in outdoor bus yard.

Watthour Meter Accuracy as Affected by Temperature Changes—II

By D. T. CANFIELD, Instructor in Electrical Engineering, Purdue University, Lafayette, Indiana*

FOR the most part the curves are self-explanatory, but care should be used in interpreting them to note carefully the large scale used so as not to assume that the errors introduced are excessive. Within the range customarily met in practice these errors are relatively very small, and for that reason it was necessary to enlarge the scales to make them noticeable at all.

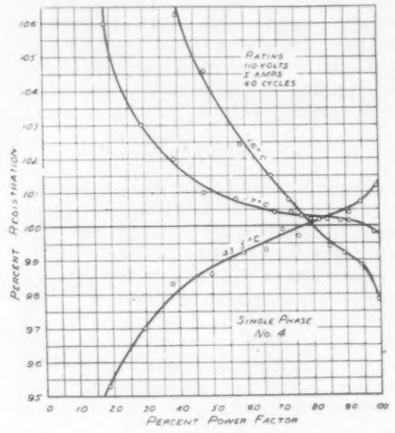


Fig. 8. Typical peformance curves of meter No. 4.

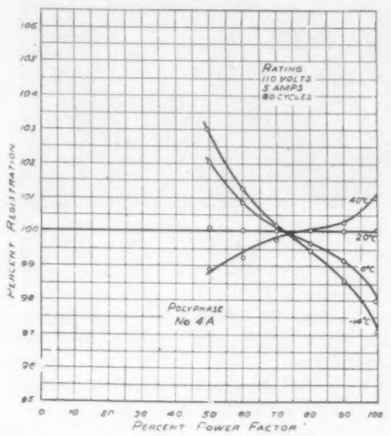


Fig. 9. Typical performance curves of meter No. 4-A.

In the case of polyphase meters, as illustrated in meter 4-A and 4-B (Figs. 9 and 10), some slight difference in the performance will exist if the elements are interchanged. Tests also were made with unbalanced voltages and unbalanced currents on polyphase meters, but no difference was noticed in the performance curves.

The only control the utilities have over the form of these curves is in the matter of lagging. The rest is a design problem in the hands of the manufacturers. To determine the effect of changing the lag adjustment upon the temperature-power-factor curves, the lagging in meter No. 5, Fig. 12, was reduced and the meter again tested. The result is illustrated by the curves of Fig. 13. This indicates that the slope of these curves is affected by the lagging and that at some temperature it is possible in every meter to have perfect performance. As an illustration see meter No. 4-A, Fig. 9, where the test at 20 deg. C. happened to be at the temperature at which the meter was lagged.

Figure 14 shows the effect of a leading power factor upon the typical performance curves. These curves show that where the meter speeds up as the power factor decreases on lagging power factor it will slow down on leading power factor.

Discussion of Curves

For the purpose of interpreting the results of this study it is necessary to divide the meters into two groups, the first single phase, and the second polyphase.

A study of Figs. 12 and 13 will show that meter No. 5 is in a class by itself as its typical performance curves show an entirely different characteristic from the other four. In the first place the curves are practically parallel and therefore the meter shows little tendency to be self-compensating. Furthermore, the range of error at unity power factor is nearly double that of any of the others. The range is approximately ± 4 per cent which precludes its use wherever it might be exposed to any considerable range of temperature.

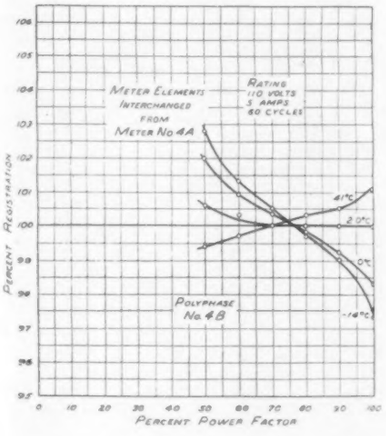


Fig. 10. Typical performance curves of meter No. 4-B.

However, by proper lagging this meter would have horizontal temperature-power-factor curves which would represent excellent performance providing the temperature varied only over narrow limits.

The remaining four single-phase meters have an average range of error at unity power factor of approximately $\pm 2\frac{1}{4}$ per cent. This range decreases to $\pm 1\frac{1}{2}$ per cent at 90-per-cent power factor and to ± 1 per cent at 80-per-cent power factor.

Since little is known as to the power factor at which single-phase meters normally operate, it will be assumed that a range of from 85 per cent to 95 per cent will cover the average house-type meter.

The average range of error at 95-per-cent power factor for meters Nos. 1 to 4 inclusive is $\pm 1\frac{3}{4}$ per cent and at 85-per-cent power factor it is $\pm 1\frac{1}{4}$ per cent over a range of temperature from 4 deg. F. to 104 deg. F.

This means that for meters installed indoors no appreciable temperature errors will exist. Since meters installed outdoors usually are calibrated in the summer the tendency will be for them to run slow for all but the summer months. If it were possible to calibrate all outdoor meters at a mean temperature the average registration for the year probably would be nearly correct.

In the case of polyphase meters the range of power factors should be extended from 95 per cent to 50 per cent. The corresponding range of error then becomes approximately $\pm 1\frac{1}{2}$ per cent to $\pm \frac{3}{4}$ per cent on the average.

Since polyphase meters are not often mounted out-of-doors they will not be subjected to extreme changes in temperature and therefore their temperature errors are negligible.

Conclusions

The work as previously outlined seems to justify the following conclusions:

1. That most watthour meters show a decided tendency to be self-compensating to changes in ambient temperatures.

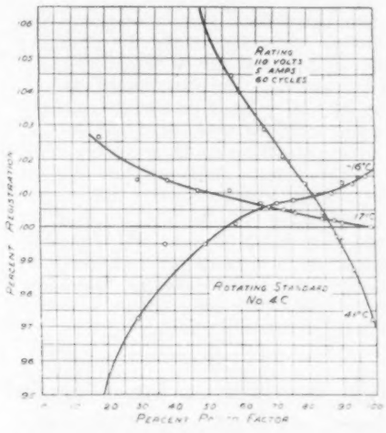


Fig. 11. Typical performance curves of meter No. 4-C.

2. That it is possible by proper lagging to obtain virtually perfect performance at some one temperature, that temperature being the one at which it was lagged.

3. That in the case of polyphase

*From Bulletin No. 22, Engineering Experiment Station, Purdue University.

meters some slight difference in performance exists on change of phase sequence.

4. That ordinary unbalance of load will not affect the form of the temperature-power-factor curves of polyphase meters.

5. That temperature errors of single-phase and polyphase meters are not appreciable if the meters are installed indoors and subjected to normal conditions of temperature and load.

6. That for single-phase and polyphase meters installed out-of-doors the temperature errors may be appreciable especially if they are calibrated at extremely high or low temperatures.

7. That in any case the average range of error will not exceed $\pm 2\frac{1}{2}$ per cent from 4 deg. F. to 104 deg. F.

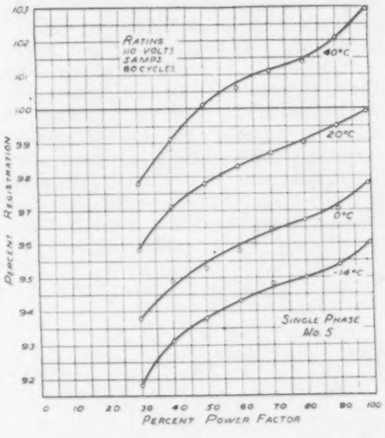


Fig. 12. Typical performance curves of meter No. 5.

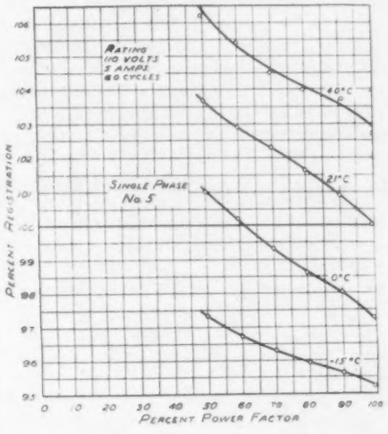


Fig. 13. Effect upon performance curves of reducing the lagging.

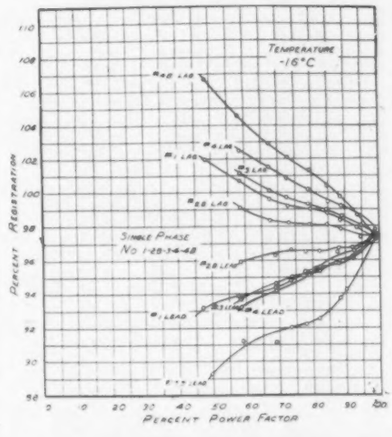


Fig. 14. Effect of leading power factor upon performance curves.

Nitrogen Gas Facilitates the Shipment of Transformers

Through the use of nitrogen gas it now is possible to ship large power transformers from Eastern factories to Pacific Coast points with great saving in time in placing the transformers in service at their destinations. In at least two cases of recent record large power banks, in one case a 20,000-kva., 110-kv. bank of three single-phase transformers, and in the other case a 25,000-kva., 110-kv., three-phase transformer unit, were shipped across the country in an atmosphere of nitrogen under pressure. The former went into service at the Salinas (Calif.) substation of the Pacific Gas and Electric Company, while the latter went into service at an Oakland (Calif.) substation of the Great Western Power Company.

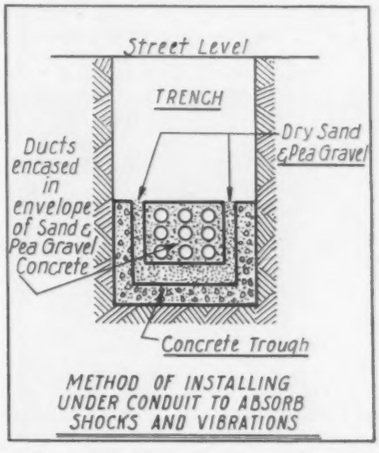
After completely drying out the transformers at the factory incident to the usual service tests, nitrogen gas was circulated through the transformer tanks until the oxygen content was reduced to 1 per cent. At that time the circulation was stopped and additional nitrogen gas was introduced until the pressure inside of the case amounted to approximately 3 lb. per sq.in. at 15 deg. C. Through the use of this initial pressure in the transformer tanks the transformers could be shipped without fear of leakage of air or moisture from the outside into the tank because the pressure gradient was in the reverse direction. As an additional precaution and also to serve as an indication of the possible presence of moisture when the transformer should arrive at its destination, a bag of calcium chloride was placed within the tank.

Tests made upon the transformer units upon their arrival at destination showed that the nitrogen gas pressure had dropped only about half and that the oxygen content still was less than 2 per cent. The calcium chloride showed that there was no moisture present and consequently the transformers were filled with dry transformer oil and immediately placed in service with complete satisfaction.

Thus there are two important factors incident to the shipping of transformers in nitrogen gas. One of these is the great reduction in shipping weight: in the case of the above mentioned three-phase units, the reduction amounted to 32.5 tons. A second factor is the reduced installation expense and time-delay which results from the transformers being received in a serviceable condition obviating the necessity of a dry-out.

Gravel Cushion Overcomes Duct-Line Damage

Damage to underground duct lines where those lines pass under street-car and railroad-track crossings was experienced so frequently by the Puget Sound Power & Light Company that underground engineers of that company devised the scheme indicated in the accompanying illustration for overcoming that difficulty. In the ordinary type of construction the fiber conduits with their concrete envelope were laid directly in a trench under the crossings, the same as at any other spot in the duct line. However, the excessive vibration incident to the frequent passing and repassing of street cars and trains resulted in fractures of the envelope, breaking of the conduits and, in many cases, serious damage to the cables themselves.

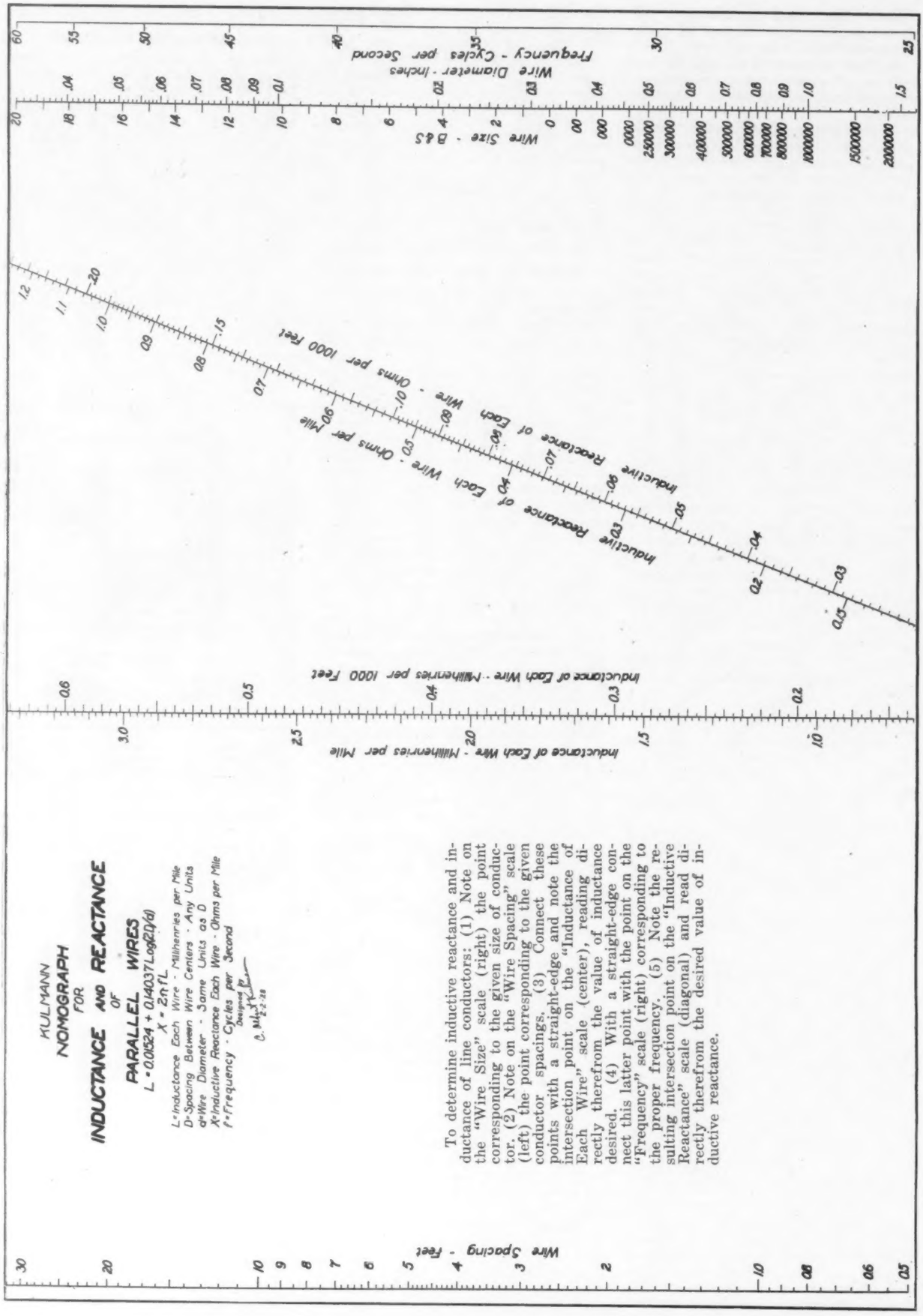

Street Level
TRENCH
Dry Sand & Pea Gravel
Ducts encased in envelope of Sand & Pea Gravel Concrete
Concrete Trough
METHOD OF INSTALLING UNDER CONDUIT TO ABSORB SHOCKS AND VIBRATIONS

This scheme of construction has proved effective in overcoming duct-line damage incident to vibration caused by nearby passage of trains.

Extensive experimentation in the effort to overcome this difficulty proved the success of the new scheme. In this new scheme the usual duct line with its ordinary concrete envelope is placed within a concrete trough as shown, though completely separated from that trough by a packing of dry sand and small gravel. This type of construction is carried under the entire track crossing and to a point at least 8 or 10 ft. in the clear each side of the tracks. To perfect the cushioning effect of the sand and gravel lining between the duct line envelope and the concrete trough the sand and gravel packing is placed dry.

Observations over a period of time indicate that this new type of construction is eminently satisfactory in reducing damage due to vibration incident to the passage of cars or trains.

The horsepower used in England, per man, is about half that required in the United States. It is no mere accident that wages also are half. The horsepower used per man in Japan is about a fourth of that used in the United States and curiously enough the wages also are one-fourth.


KULMANN
NOMOGRAPH
FOR
INDUCTANCE AND REACTANCE
OF
PARALLEL WIRES
L = 0.0624 + 0.4037 Log(2D/d)
X = 2πfL
L = Inductance Each Wire - Millihenries per Mile
D = Spacing Between Wire Centers - Any Units
d = Wire Diameter - Same Units as D
X = Inductive Reactance Each Wire - Ohms per Mile
f = Frequency - Cycles per Second
Designed By
C. M. Kulmann
2-2-38
Wire Spacing - Feet
Inductance of Each Wire - Millihenries per Mile
Inductive Reactance of Each Wire - Ohms per Mile
Inductive Reactance of Each Wire - Ohms per 1000 Feet
Wire Size - B & S
Wire Diameter - Inches
Frequency - Cycles per Second

To determine inductive reactance and inductance of line conductors: (1) Note on the "Wire Size" scale (right) the point corresponding to the given size of conductor. (2) Note on the "Wire Spacing" scale (left) the point corresponding to the given conductor spacings. (3) Connect these points with a straight-edge and note the intersection point on the "Inductance of Each Wire" scale (center), reading directly therefrom the value of inductance desired. (4) With a straight-edge connect this latter point with the point on the "Frequency" scale (right) corresponding to the proper frequency. (5) Note the resulting intersection point on the "Inductive Reactance" scale (diagonal) and read directly therefrom the desired value of inductive reactance.

Nomograph for the Determination of Inductance and Inductive Reactance Between Wires

By C. ALBERT KULMANN, Pelton Water Wheel Company, San Francisco.

TABLES for the inductance and reactance of wires are to be found in any electrical engineer's handbook, but leave much to be desired in their limitations. Interpolation is necessary with but rare exceptions and, if accurate, all this consumes considerable time. Further, if complete, a table must be given for each frequency, and this rarely is done.

However, with the nomograph shown on the opposite page all variables are represented and the solution of these inductance and reactance problems may be made quickly and accurately and fully as simply as with tables. The equations upon which the chart is based are the usual ones:

$$L = 0.01524 + 0.14037 \text{Log}_{10} \left(\frac{2D}{d}\right)$$

$$X = \pi f L$$

where **L** is the inductance of each wire in millihenries per mile, **D** is the distance between wire centers in any units, **d** is the wire diameter in the same units as **D**, **X** is the inductive reactance of each wire in ohms per mile, and **f** is the frequency in cycles per second. In the case of stranded cables, **d** is taken as the diameter of a solid conductor of equal area because this involves an error smaller than the variation in the cable itself.

In using the chart lay a straight-edge from the scale point corresponding to the given value of wire size or wire diameter to the scale point corresponding to the proper value of wire spacing and note the intersection with the center scale and read therefrom the inductance of each wire. Connect this point with the scale point corresponding to the proper frequency and read the inductive reactance of each wire from the resultant intersection point on the diagonal scale.

For this and subsequent illustrative problems assume a 100-kv., three-phase, 60-cycle transmission line carrying a 50,000-kw., 85-per-cent power factor load. Then the line current would be 340 amp. and, assuming 1,500 circ.mils per amp., the cross-sectional area of each conductor would be 510,000 circ.mils. Assuming stranded conductor, this figure may be left in this form.

In the third article of this series (Electrical West, Dec. 1, 1928, p. 337) the value 12.6 was determined as the equivalent spacing of the three-phase line assumed for this series of problems.

On the nomograph on the facing page lay a straight-edge from the 12.6 point on the "Wire Spacing" scale to the 510,000 point on the "Wire Size" scale. Thus placed, the straight-edge intersects the "Inductance" scale at the 2.035 point (2.035 millihenries per mile) giving one of the values sought. This figure may be read per 1,000 ft. if desired. Placing the straight-edge from this 2.035 point on the inductance scale to the 60 point on the "Frequency" scale gives an intersection point on the "Inductive Reactance" scale which reads 0.767 ohm per mile, the second of the values sought. This value, too, may be read in terms of 1,000-ft. lengths if desired.

EDITOR'S NOTE: This is the fourth of a series of useful nomographs prepared by the author from mathematical and experimental data. The fifth will appear in a subsequent issue of ELECTRICAL WEST.

NEW BOOKS
for the Engineer

ELECTRICAL SUBSTATIONS, by H. Brazil, M.I.E.E. First edition; 6 x 8½ in.; cloth bound; 215 pages; 92 illustrations. Published 1928 by Edward Arnold & Company. Distributed by Longmans, Green & Company, 55 Fifth Ave., New York. Price $5.—The electrical substation has come into prominence in England with the passage of the Electricity Act of 1926. The present trend is toward interconnected transmission and distribution systems which will permit the abandonment of small and inefficient generating plants. The author deals with the design and arrangement of the substation itself and with the more important characteristics of the equipment utilized therein. With 27 years of experience in electrical supply in London the author is in a position to speak with some authority upon British practice and trends.

MECHANICAL POWER TRANSMISSION by William Staniar, Mechanical power engineer for E. I. du Pont de Nemours & Company and its subsidiaries. First edition; 6 x 9 in.; cloth bound; 409 pages; 326 illustrations. Published 1928 by McGraw-Hill Book Company, Inc., 370 Seventh Ave., New York. Price $5.—For sale by Technical Book Shop, 883 Mission Street, San Francisco.—This book is designed for the plant engineer, draftsman, maintenance man, master mechanic, or millwright whose responsibilities include the distribution and transmission of mechanical power. The text is strictly a practical text written in non-technical language and without any involved mathematics. The author has based his work upon his 24 years of experience in this field and his book is intended as a guide or handbook that will give the reader the benefit of practical experience that he may not have had himself. This book is indeed a noteworthy publication.

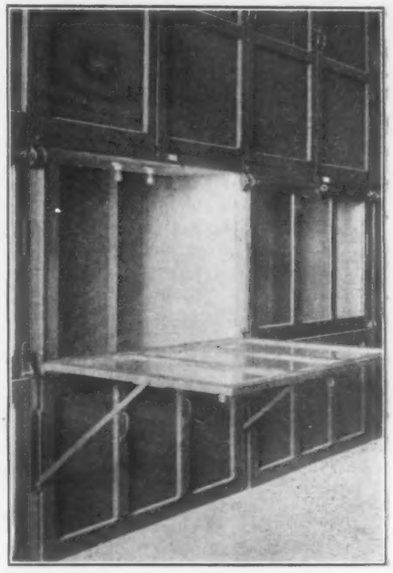
INDUSTRIAL EXPLORERS, by Maurice Holland, director, division of engineering and industrial research, National Research Council, with Henry F. Pringle. Cloth bound; 6 x 8½ in.; 346 pages; illustrated. First edition, published 1928 by Harper & Brothers, New York. Price $3.—Here are word portraits of the leaders of our industrial research. Through biographical sketches of nineteen eminent scientists are recorded in a most interesting manner the invaluable contributions of industrial research to modern life. This is a book not only for the engineer but also for any and all who are interested in the hard facts or the romance of modern industrial development.

CONOWINGO, an artistic, profusely illustrated 32-page booklet illustrating the various phases of the gigantic Conowingo power development. The theme of its text is the basis of co-operation between engineer and banker in an engineering undertaking. Published and distributed by Stone & Webster, Inc.

PATENTS—LAW AND PRACTICE, by Oscar A. Geier. This 48-page cloth-bound booklet has been prepared by the author to give those interested in patents and trade-marks some of the more important and up-to-date information pertaining to these subjects. A copy of the book will be mailed free of charge to those addressing a request to Richards & Geier, patent and trade-mark attorneys, 274 Madison Ave., New York, N. Y.

Glass Door Gives Visibility and Operating Clearance

To facilitate the operation of 11-kv. disconnecting switches and at the same time to provide sufficient clearance to insure safety for the operator, the Portland Electric Power Company is using the scheme shown in the accompanying illustration. Each three-phase disconnecting switch compartment is enclosed by means of a drop-door fitted with wire-glass and arranged with a mechanical support which permits the door to drop to a horizontal position only. With the door open to the horizontal position easy access is provided to the switch compartment and at the same time the width of the door forces the operator to stand at a safe distance while operating the disconnecting switches. Furthermore this group arrangement makes impossible the accidental operation of disconnecting switches from two groups of lines in adjacent positions at any one time.



Safety door on 11-kv. bus disconnecting switch compartment in the Jefferson substation of the Portland (Ore.) Electric Power Company.

The simplicity of the mechanical arrangement is indicated in the illustration and consists only of a double side-latch controlled from the center of the door and designed to be operated with the switch stick, an ordinary pivot hinge at the lower end and a sliding angle brace which serves as a support when the door is opened and is completely out of the way when the door is closed.

The red and the green signal lamps give an indication of the closed or open position of the corresponding oil circuit breaker, an additional safety feature. If both of the lamps are "black" that fact in itself is a warning of something wrong.

Ideas for the Contractor

Shall We Have a Motor Forum?

A Place Each Month in Which to Discuss and Exchange Ideas Upon the Business, Mechanical and Selling Problems of Motor Dealers?

MUCH has been written and more said about the various things apparently wrong with the motor dealers' business. Interviews with individual dealers bring to light many varying opinions on the measures to be employed in remedying these so-called "deplorable" conditions. However, these same interviews disclose an overwhelming agreement of opinion as to the causes of these selfsame conditions. Stripped of all flowery verbiage and stated in the baldest of terms, this unanimity of opinion centers on "manufacturer competition" and "incompetent dealer conmpetition."

"Manufacturer competition," of course, refers to the present-day practice of manufacturers' salesmen selling within the territory which some individual motor dealer feels rightfully belongs to him. "Incompetent competition" usually applies to each and every motor dealer in his town—except himself. An honest analysis of the entire situation will reveal many things to the thinking man. This analysis must not alone include the "manufacturer" and the "competitor" angle; it must also include the "personal" angle of each individual dealer himself.

In the Mirror

Let the individual making the analysis first ask himself these questions:

1. What are the requirements (in mechanical knowledge) of a competent motor-dealer?
2. What obligation does the motor-dealer assume toward the buying public?
3. What attitude should each motor-dealer assume toward his competitors?
4. What is the *cause* of manufacturer-salesmen competition?

Taking these questions in numerical order and assuming, for the purpose of the analysis, that the writer is a motor dealer (which he is), his answer to question No. 1 would be:

A motor dealer must have a considerable fund of knowledge regarding characteristics of the different types of alternating and direct current motors and generators, and the various types of regulating and control equipment used in connection therewith. (This is considering only the knowledge needed to *sell* motors intelligently. No consideration will be given here to motor repairs or business methods.)

The next question is easily answered by any motor dealer who has given intelligent consideration to his business:

A Prominent Motor Specialist Asks Your Opinion

WHATEVER may be the ills of the motor business, certainly more knowledge of the game will contribute to remedying them. Feeling that a place in the Contractor Section might well be devoted to an interchange of ideas, shop kinks, methods of work and of process, to the discussion of policies, franchises and business methods, to selling helps and methods of developing business for motor-dealer specialists, Electrical West offers this new feature to its readers if sufficient evidence of its need is expressed. Acceptance of this new feature, however, will carry with it the reader's responsibility to contribute to it from time to time ideas, pictures and suggestions. On with the play!

The dealer assumes the responsibility of advising the buyer as to the type of motor and control equipment best suited to the kind of work the buyer wishes to do. This responsibility the dealer automatically assumes, owing to the assumption on the buyer's part that the dealer should be competent to render this service. The ability honestly and competently to give this advice spells the difference between success and failure.

Answering the third question:

Any individual who engages in business (of any nature) immediately assumes an obligation toward his competitors. This obligation covers the three fundamentals of all good business:

First: *Recognition of the fact that legitimate competition is the basic principle of all business.*

Second: *Recognition of the fact that survival in business is predicated upon the practice of honesty in dealing with the public.*

Third: *Adherence to a strict code of business ethics which is based upon honesty and square-dealing, each with the other.*

That these principles are lost sight of sometimes by the individual in no wise alters the fact that survival in business is dependent upon strict adherence thereto.

The answer to question No. 4 is **dealer incompetency!**

Naturally this assertion is going to bring forth a storm of protest. If it does, the writer has attained his object. Let us analyze this statement honestly, in so far as it concerns each one of us personally. Going back to the answers to questions 1 and 2:

Do you fully realize how much personal knowledge and experience is required for a motor dealer to meet these specifications? Have you this knowledge and experience?

The writer has been told that it is the general practice of the large motor manufacturers to take young men who have just completed their college courses, put them in the shops and laboratories for a period of one year or longer, and then send them to the local sales agencies as embryonic salesmen. Naturally, it is the supposition that their college educations, plus the first hand knowledge of the product acquired during their factory apprenticeship, will equip them to become first-class motor salesmen. And it **usually does!**

The writer holds no brief for or against a college education. If a man has been fortunate enough to have had a college education, theoretically he should be better equipped than one who has not had that advantage. However, many shining examples of success in all lines of business, are recorded among the "self-made" men. And the fund of experience acquired by the practical man sometimes far outweighs in value the advantage of a factory apprenticeship.

Course of Treatment

But, the fact remains that the man buying a motor has a tendency to favor the men who are equipped to make intelligent recommendations when he asks for such service. And the dealer who does not care to devote the necessary time to acquire the needed knowledge has no call for sympathy if the manufacturer's salesman takes the business away from him.

In meeting competition of any kind there is always one **best** way of meeting it.

It is the writer's opinion that **self education** is the answer to most of the motor dealers' problems. And to attain the best results, this education should be acquired through **local groups.** Take for an example the work now being done by the Association of Electragists, International, in forming local motor sections.

This good work started in California and while it is by no means a "cure-all," it is a step in the right direction and undoubtedly will prove of inestimable value to the motor dealer fraternity. Frank discussion of problems, and honest exchange of opinion, are the surest cure for the ills of any line of business. Any community which is afflicted with motor-dealer problems should obtain quick relief if local dealers will form a motor section and meet regularly for frank discussion of their problems.

Another point of advantage the manufacturer's salesman has is the large fund of authentic test data which is available for his reference. The larger companies are acquiring data pertaining to every line of business. These data are prepared in such form as to be assimilated easily by the busy executive who may be interested in buying motors. By presenting these data to the prospect the manufacturer's salesman gains an advantage over the local motor dealer who through lack of experience may have no data to present.

The foregoing discourse has been presented for the purpose of placing before all motor dealers a proposition which the writer feels may have some merit. The proposition is this:

Why not inaugurate an open forum for the following purposes:

1. To discuss problems pertaining to the motor dealer's business?
2. To exchange information on selling methods and repair shop practice.
3. To exchange reference data pertaining to motor applications and installation.
4. To conduct a "questions and answers" section wherein problems will be accorded full consideration and discussion.

The publishers of "Electrical West" have agreed to set aside a reasonable amount of space in the magazine each month to conduct such a department provided the motor dealers will express the desire for this service. If you are interested and feel that you will derive some benefit from a movement of this kind, write at once to the contractor editor.

The writer has a vast amount of reference data, accumulated during a period of 30 years, which he is ready and willing to contribute to the motor-dealer fraternity without cost. If other dealers will lend their support to the movement they will be contributing toward the uplift of the motor-dealer business.

It all depends on the response. Let us hear the echo!

A Proposal to Curb "*Shyster*" Building Financing

Legislative Act Sponsored by Builders Exchange Which Deserves Support of All Building Crafts Seeking to Stop Losses Due to This Evil

LOSSES because of inadequately financed or fraudulent building projects, especially in cases where mechanics' lien rights are nullified, have been such common occurrences wherever speculative building is carried on to any considerable extent that a desperate effort is to be made by the building industry to curb the evils of shyster financing. The attack is being headed by the State Builders' Exchange of California.

Legislation will be sought at the next session which will require statements of ownership and encumbrances immediately preceding any kind of construction in the State of California. J. W. Morin, president of the Pasadena Bar Association, has drafted a bill which should go far to correct this evil.

Building in the Dark

The Pasadena Builders' Exchange, which initiated this movement, recently made the following statement regarding its purposes:

One of the outstanding evils of building conditions today is the lack of ready information available to builders before entering into a contract to furnish labor or material or both.

What does the average contractor know about the condition surrounding a particular piece of property at the time he enters into a contract to furnish certain commodities, whether work or labor, to be used in the construction of an improvement to be erected on the property? He may know the name of the person directly employing him, the general contractor's name, the name of the owner, the general location of the property, the general nature of the improvements to be built, and the details of his own proposed particular contract.

From the foregoing meager data it is absolutely impossible for him to glean such information as is vital to him if he is to decide intelligently whether or not the proposed contract is a good risk. He knows nothing about the condition of the title, the so-called owner's interest therein, whether the property is fully paid for, how the building project in question is to be paid for, when and where he is to be paid for the fulfillment of his contract. In short, the probability or even the possibility of his being compensated for his efforts is only guesswork on his part.

Furthermore, under existing conditions it is almost impossible for him to determine these facts without a great deal of investigation, and in the meanwhile someone else who is not so careful or particular will have been awarded the contract while he is trying to make up his mind. Thus the present-day builder must choose between taking chances that the ordinary business man would term extremely hazardous, or lose contracts because of his careful, but necessarily dilatory tactics.

The obvious remedy for this evil is to make the necessary information available to all alike, by making it compulsory for owners or their agents to file a statement in some public office, such as the county recorder's office, which will set forth the salient facts which every builder is entitled to and which he should have in order to determine whether or not he will accept the proffered employment.

BY REVEALING the exact nature of the financing of a building project subcontractors may protect themselves against questionable contracts which might otherwise appear safe enough to undertake.

It was with these purposes in mind that Mr. Morin's bill, reproduced on next page in full, was drafted. The bill in its present form does not affect the Mechanics' Lien Law of 1911, which is essentially a law for the collection of indebtedness. But that law does not prevent loss by any anticipation of those conditions which cause the loss. The Morin bill proposed is merely to supplement the lien law, in other words to lock the door before the horse is stolen.

Frenzied Finance

In his statement regarding the study of building conditions which caused his action in drafting the bill, Mr. Morin says:

It has been found that in the matter of large losses caused on specific building enterprises, visionary, incompetent or crooked owners are as much to blame for the loss as the irresponsible contractor involved. Many owners start a building without having clearly planned its financing to the finish, hoping that in some manner they may get what money is necessary during the construction or soon thereafter.

Buildings are oftentimes built on land which is merely held on contract, or on "borrowed land," land which has been deeded to the so-called owner by another person who has received no cash for the deed but has taken a second or third mortgage or other encumbrance expecting to get paid eventually upon the final success of the enterprise, which means the completion of the building and its sale.

Many of these transactions, in other words, are characterized by an utter absence of financial investment by the so-called owners, all the real risk being the risk of the person who loaned the money, loaned the property, or furnished the labor and materials.

These transactions are almost always characterized also by exceedingly high interest rates, high commissions and other picturesque details of so-called high finance. Commissions sometimes run so high as to make the average interest rate more than 16 per cent per year. If the same business enterprise, such as that of a public service corporation, even under protection of the

public, cannot afford to pay over 6 per cent for borrowed money, it is impossible to believe that the people who conceive and attempt to carry out enterprises of the sort described can afford to pay 16 per cent or even a rate of interest substantially greater than the prevailing interest rate for borrowed money at the time.

It thus results naturally that either these building enterprises are not carried to a physical completion, or if completed the indebtedness, actual or watered, is equal to or greater than the value of the completed structure, and it is even more excessive where the structure is uncompleted.

"Too Late for Herpicide"

Even where lien rights are exercised, if the property has to be liquidated the electrical contractor cannot recover more than such materials as can be removed without damage to the building. Mr. Morin continues:

The proposed statute has the effect of requiring a statement of the ownership and the proposed financing of a building. As a result of this it brings about an abrupt termination of a building project before it is begun if the project is visionary, crooked or improperly financed. Therefore the various classes in society that would otherwise lose their money will be greatly benefited thereby. This is in line with the fundamental theory of the law, which is to prevent loss rather than merely to assist in the collection of a loss, and is now the prevailing theory under the mechanics' lien legislation as it has stood for the last eighteen years.

If a simple provision such as that introduced in the suggested law requires all the essential information touching on the subject to be gathered together and recorded at an appropriate time in the beginning of the enterprise, it will be exceedingly easy for all persons who are invited to become concerned therein to look at this scheme of financing in a particular case, check up on the facts from the clues therein contained, and then go in or stay out of the enterprise as the evidence warrants on such examination. They will have in the *beginning* therefore all the information which at the close of the enterprise they may wish they had had, under present conditions.

The Morin bill received the endorsement of the State Builders' Exchange at its recent convention in Santa Barbara. Various crafts have likewise endorsed it. The California Electragists, at the Fresno convention in October, also gave it unqualified endorsement. The Electragists' organization urged the support of the bill by every electrical contractor in the state.

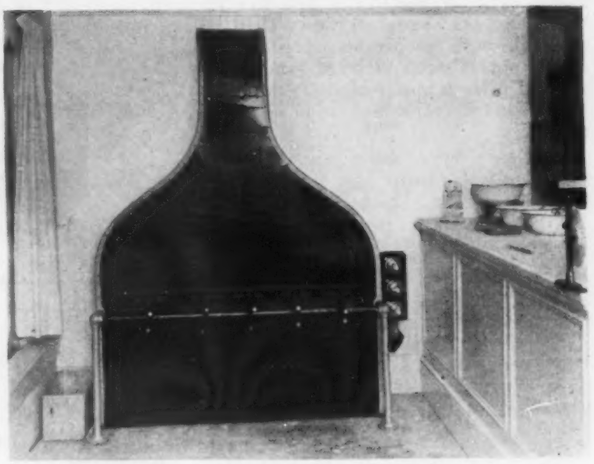
Full Text of Bill

The full text of the bill follows:

Proposed Statute Requiring Statements of Ownership, Statement of Encumbrances and Terms and Conditions Thereof Immediately Preceding or Following the Beginning of Construction, and Providing Penalties for the Violation Thereof.

Prior to or immediately following the beginning, as heerinafter provided, of any work or construction, alteration, addition to or repair, either in whole or in part of any building, wharf, bridge, ditch, flume, aqueduct, well, tunnel, fence, machinery, railroad, wagon road, or other structure, under such circumstances, that a right of mechanics' lien might arise in favor of persons who furnished labor and materials, or labor or materials contributing thereto, and not more than ten days immediately prior to said beginning, or within five days after the beginning thereof, there shall be filed in the office of the county recorder of the county wherein said real property is situate, a notice in writing duly verified upon the oath of the owner or some other person acting for and on behalf of the owner and with his authority, having knowledge of the facts, which notice shall be called a notice of intention to build; said notice shall be in writing, shall contain a legal description of the property upon which it is proposed to erect said improvement sufficient for the ready identification thereof, the name and address of the owner or owners thereof, and the nature of the so-called owner's title, whether the same be in fee or held under contract or otherwise; also the names and addresses of all persons holding encumbrances against said property and the amount and nature thereof; and also a statement as to whether or not the amounts represented by the obligation referred to in said encumbrances have been advanced or not, and if not, in general terms the conditions under which said advances are to be made. Any persons who shall enter upon and continue the erection of a building or improvement or other structure under the terms of this act, either as owner or contractor without the declaration of intention to build, as herein required, being recorded, shall be deemed guilty of a misdemeanor, and any person who wilfully makes a false statement in said declaration of intention, or shall conspire to furnish a false statement in a declaration of intention to be recorded, shall be guilty of a misdemeanor, and their right, title and interest, if any, in said property shall also be subordinated to any other claimant who may be injured thereby. Nothing herein contained shall be deemed to require the recording of any notice of intention to build in the case of work initiated under the authority of the state, or any county, city and county, city or other political subdivision whatsoever, nor shall anything herein be deemed to affect work or improvements upon the operative property of a corporation under the regulation of the State Railroad Commission, nor in the case of any work or improvement wherein the entire project shall involve or incur an expense or outlay or obligation of a total less than $500.

Something New—a Waffle Oven



Brought over from Holland but adapted to American ways of heating, this Salt Lake City waffle oven introduces a new use for electric standard space-heating elements.

A unique installation to take care of a customer's requirements for the making of waffles on a commercial scale recently was made by the Utah Power & Light Company in Salt Lake City. This device is an electric oven used for heating waffle irons which the proprietor of the Holland Dutch Waffle House brought from Holland many years ago. These irons are oblong, about 4 x 8 in., and about 2 in. thick. They have handles about 2 ft. long. In Holland they are heated by holding over a bed of red hot coals. After they are pre-heated a very rich batter is poured in the irons, and they are then turned over and over to maintain a uniform heat on top and bottom. The result is a very crisp waffle, over which sugar and melted butter are sprinkled.

It was decided that more modern methods could be adopted in the heating of these irons, and naturally electricity was given serious consideration and first choice. The problem, however, was to develop a satisfactory oven, as the customer refused to allow units to be attached to the irons, and capacity was required for at least ten irons. The solution was finally reached in the designing and installing of the electric oven shown in the picture. The same insulation as is used in bake ovens was used to insulate this oven. Six 1,500-watt Chromalox units give almost any heat desired. Three-heat reciprocating switches are mounted on the side of the oven as in large bake ovens.

This installation is believed to be the only one of its kind in the entire country. The results of its operation have been increased efficiency, economy and convenience, and the proprietor of the waffle establishment is more than pleased.

The oven was designed by the general power sales department and sales department of the Utah Power & Light Company's Salt Lake division, and constructed under their supervision.

Electric Truck Handles Loads at Oil Plant

At the Associated Oil Company plant located in Alameda, Calif., a large concrete warehouse is used for handling package goods and lubricating oils. Electric tractors are used for handling

package goods throughout the plant, the operation of these trucks being greatly facilitated by the paving of the entire yard with concrete.

First Red Seal Homes in Mexico Built Across Border at Mexicali

Officers of the Compania Industrial Jabonera del Pacifico, at Mexicali, Mexico, just across the border from Calexico, Calif., built all-electric homes for themselves. At the suggestion of The Southern Sierras Power Company salesmen, George Rankin, Red Seal representative, checked them and found them according to Red Seal standards, and certificates were awarded to Juan Brittingham, general manager, Nelson Brittingham, general superintendent, and Edward Brittingham, assistant general manager, whose homes are shown above respectively from left to right. The Southern Sierras Power Company serves this Mexican industrial company.

All Branches Co-operate in Lighting School

A series of lighting classes sponsored by the California Electragists, Southern Division, and participated in by the Los Angeles Gas and Electric Corporation, Southern California Edison Company and Bureau of Power & Light, Los Angeles, has just been completed with the most successful results of any similar school endeavor carried on so far. At the three dinner-meeting classes there were present 82, 72 and 65 contractor dealers, jobbers' representatives and lighting specialists.

A series of three meetings had been planned previously but only a small attendance turned out. A new plan was attempted. The co-operation of the jobbers was asked to get their salesmen individually to be responsible for bringing to the meeting a dealer or more apiece. The three power companies shared in the cost of the dinner which was cooked electrically and served by the staff of the Bureau of Power & Light display room under the hospitality of A. B. Elliott, manager of the display. In this way the dealers had an opportunity to see the display room and learn how it could help them in the sale of appliances and also learned what could be done in the way of cooking a complete banquet dinner on a number of home ranges such as are kept in the show room for demonstration purposes.

Those participating consisted of the Electragists, power companies, jobbers, jobbers' salesmen, contractor-dealers, lamp company men and fixture manufacturers, brought together for the first time in a co-operative school endeavor of this kind. The arrangements for the Electragists were under the charge of P. A. Schrader.

At the first meeting, Nov. 26, D. L. Simonds, of the Los Angeles Gas and Electric Corporation, acted as temporary chairman. His subject was "Breaking the Ice," a short story of lighting service activities carried on by the various power companies. F. D. McKinstry, lighting specialist for the Bureau of Power and Light, spoke on "Better Lighting Creates Additional Business." J. L. Kamm, Southern California Edison Company, spoke, giving the reasons "Back of the Better Lighting Program."

At the second meeting, Dec. 3, Mr. McKinstry acted as chairman. The first talk, "Key to Better Lighting Business," was by R. V. Ludlum, Edison Lamp Works. This was followed by working out a practice problem directed by Mr. Kamm.

The third meeting was on Dec. 10, and Mr. Kamm acted as chairman. His subject was "Better Lighting Is the One-Story Game." He was followed by Mr. Simonds who talked on "Why your Customer Wants Better Lighting," and Mr. McKinstry concluded by telling those present that "The Lighting Service is Yours for the Asking." Impromptu speakers were Mr. Ludlum and Frank A. Hansen of the Holophane Company,

It is planned that a similar series of classes will be held featuring electric heating beginning some time in January and operating under a similar arrangement between power companies and Electragists.

Electric Clock Mounted as Advertisement

The largest Telechron clock on the Pacific Coast was installed recently by the California Electrical Construction Company, of San Francisco, at 896 Post St., to become an advertising feature for a tire-supply house. A special six-watt movement, instead of the customary two-watt movement, was ordered direct from the factory as also was the large vitrolite dial.

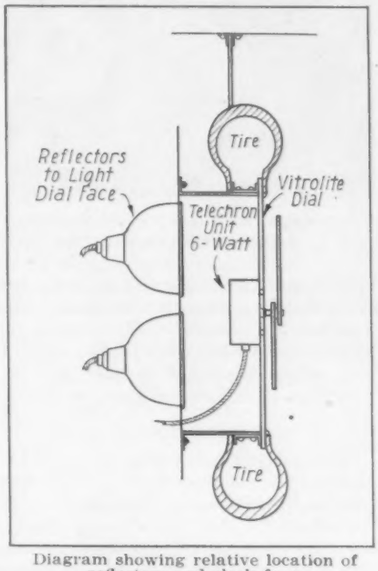


Diagram showing relative location of reflectors and clock face.

The accompanying sketch demonstrates how the clock was mounted, with reflectors in the rear of the face to illuminate the dial at night. The numerals were sand-blasted into the glass. The accompanying picture shows the effect when completed. The tire surrounding the clock face was made of heavy sheet metal.

The clock is mounted where motorists on busy arterial may see.

From the central vault circuits feed out to all parts of the plant as spokes from a wheel hub.

Centrally Located

Transformer

By H. L. GERBER
Department of Electricity,
San Francisco.

CORRECT location of the transformer vault can result in material savings to the consumer. Such location very often can more than compensate for the use of valuable floor space in the very center of a plant because of savings in power costs, transmission losses, sizes of wire and conduit and general all-round efficiency.

This is true because of the common tendency, in this era of large industrial installations, to combine the total heating, power and lighting loads on a single or combined metered load, so that the consumer may reap the benefits of the combined electrical energy sales rates offered by the power company.

In an industrial installation where the combined power, heating and lighting load is greater than 300 hp. the power company will install a transformer bank close to the installation's source of power service supply, or, if the consumer will supply the available space for a transformer vault, the power company will install its transformers in this vault on the consumer's property.

It has been the usual practice to place the transformer in some remote corner of the building, usually in whatever available space is nearest the source of supply, a space that can be most readily spared. This last item has been the one given the most consideration, when, as a matter of fact, the logical location of a transformer vault should be pre-determined and the allowable space necessary for its installation be made at that location best suited to it as a center of distribution whenever such changes can be made reasonably.

What Should Determine Location?

Before a transformer vault is installed careful study should be given to the installation before a definite location is chosen. The following questions must be decided:

1. Where is the heaviest portion of the combined load?
2. What are the operating voltages of light, heat and power?
3. What size secondary feeder wires and conduit will be required to supply the load at its required operating voltages and power factors?
4. Where are the logical locations for the power panels, the lighting transformer, the heating, and the lighting panel?

When a definite study of the installation is made, and these questions have been answered, then an intelligent selection of a transformer vault location usually can be made.

How the transformer vault location may affect the efficiency of an installation can be demonstrated if two different vault locations are assumed for an installation having the same connected load followed by a check-up on the differences in wiring and conduit costs of the two. Let us take, for example, an actual installation.

Adjustable worklight fashioned from conduit fittings.

A Typical Case

The building is a one-story, reinforced steel and corrugated sheet-iron building, occupied by the Michel & Pfeffer Iron Works. The building covers a floor area approximately 200 ft. square, or 40,000 sq.ft., and requires an equal distribution of light of one watt per sq.ft. There are 16 circuits of convenience plugs, 10 kw. of heating, and two large 60-kw. butt-welders. In addition to this there are over 300 hp. in individual machine motors.

The power transformers furnished by the power company are supplied by a 6,600-volt primary voltage and metered on the secondary, 440-volt, three-phase side. In order to take advantage of a power rate for lighting, the consumer installed a separate 50-kw., 440-220/110-volt, three-wire transformer, and placed it on the 440-volt power bus.

The logical lighting center of distribution was determined. The heaviest motor and welder loads were placed near the center of the building's floor space. Hence this location was also decided upon as best fitted for the center of distribution for the power, the heating, and finally, the transformer vault.

Compare Installation

Compare the conditions that would result in two different transformer locations. Assume the vault placed in one corner of the building, near the entrance of the source of power supply. The secondary combined power load is approximately 1,000 amp. at 440 volts, 60 cycles.

This would require three 3½-in. conduits 120 ft. long, each conduit containing three 400,000-circ.mil lead covered conductors and one 300,000-circ.mil weatherproof neutral conductor. Then it would be necessary to run an additional lighting feeder from the transformer in the vault—three No. 0 lead sheathed rubber covered wires in one 2½-in. conduit—for the same distance. Then from the 440-volt motor power panel circuits would have to be run to the two 60-kw. butt-welders. These welders are largely reactive, operating at a power factor below 50 per cent. As correct current at the welder contacts is essential for butt-welding, a wire sufficient in size to carry 318 amp. the required distance would be needed to maintain the voltage drop within 3 per cent. The lighting and heater circuits would require additional copper and conduit sizes for the proper voltage at lamp and heater terminals.

As It Was Installed

All motor and light circuit wiring was placed overhead suspended and

Vault Can Save

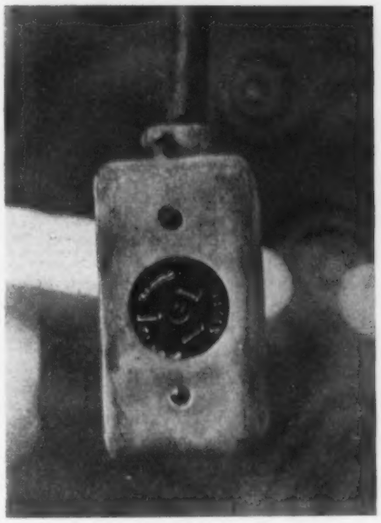
Consumer Installation and Power Costs

All conduit runs were made along room trusses from which drops to individual machines can be made at will. Note lighting units.

bolted to the steel trusses and so installed that a motor circuit conduit could be changed readily as to location without much trouble or cost. The lighting outlets were so installed as to deliver an illuminating intensity of 7½ foot-candles over the entire first-floor area. The motors were for individual machine drive, the absence of overhead pulleys and line shafts giving an unobstructed illuminated floor space. A machine could then be moved to any location and still be well illuminated.

The cost of the installation is somewhat higher than that for the average installation. The transformer vault occupies an area of about 12 x 14 ft., and figuring this amount of floor space in the center of the plant, space which usually is valued highest, the consumer was reluctant about sacrificing it for his transformer vault location.

Now let us consider conditions when the transformer vault is placed in the center, as designated. A high-voltage feeder, consisting of three No. 4 high-voltage, lead covered cables in one 2-in. conduit from outside source to transformer vault, is all that is required. The power panel, lighting panel, and heating panel are manufactured in one unit and installed upon the floor directly outside the transformer side of the vault. All long feeders, conduits and circuit wires are eliminated. The heavy secondary lighting and power buses extend from the transformer bank through a duct in the transformer vault wall direct to the main buses on the rear of the power and lighting panels. In fact the vault and various panels graphically represent the hub of this large electrical distributing wheel, the lighting and power circuits radiating as the spokes of the system.



Polarized plug receptacle for portable tools suspended from roof trusses by means of flexible rubber-covered cord.

The largest motors and the welders are within a few feet of this location and their respective circuits and conduit were of minimum requirement.

Floor Space Paid Off

It can be seen readily then that the cost of the valuable floor space is more than compensated for by the reduced cost of the electrical installation, operating at a greater efficiency than if the transformer were to the side of the building or in some remote corner.

It will not be necessary to go into a detail of construction costs to realize the advantages of the latter installation. The difference in costs is too evident.

Some of the lighting circuits were 100 ft. long, but with the use of three-wire, 220-volt, single-fusing circuits, a load of 900 watts at 115 volts could be placed on either side of the three-wire circuit, and three No. 14 rubber covered wires in ½-in. conduit were used up to a distance of 100 ft., there being not more than 2 per cent voltage drop at the lamp terminals.

From an economical and efficiency standpoint, the three-wire circuits are superior to two-wire circuits, since it would be necessary to install four No. 10 wires in a ¾-in. conduit to supply two two-wire circuits of the same load with the same percentage of voltage drop. In other words, the voltage drop on a three-wire circuit is one-half the voltage drop of two two-wire circuits.

Two Installation Features

There were two other little items on this particular installation which may be of interest to those contemplating similar work. The construction of the building would not permit the installation of all the convenience outlet receptacles for portable tools on the steel columns, so it was necessary to suspend many of them on cords from an outlet box secured to the ceiling trusses. In the handling of steel bars, steel window sashes and other materials fabricated at the plant, such articles at times strike the pendant plugs. If the plugs were constructed of a molded fibrous composition, as most pendant plugs are, they would not remain serviceable for any great length of time.

To overcome this condition a three-pole convenience plug receptacle was installed in a G. E. utility box with a plug receptacle cover. This box was secured by means of a Benjamin cord clamp to a three-conductor, rubber covered, flexible, No. 12 cord, the cord being secured to an outlet box cover by means of a cord clamp. With this type of construction the cords and plugs can withstand almost any amount of collision and abuse. A picture of a plug, so constructed and installed, may be seen in the accompanying illustration.

On the adjustable side stamp machines it was necessary to have an additional amount of illumination directly on the punches near the base of the machines. The only means of doing this was to place an adjustable bracket on the only stationary part of the machine, which was the main body of the punch. As each stamp of the machine is made a bracket arm is subjected to a very heavy shock, and an ordinary adjustable bracket does not remain stationary.

To overcome this condition an adjustable arm was made of two elbow conduit fittings, a small piece of running thread and two lock-nuts, to tighten back against the conduit fitting. Using the threads of the vertical section of conduit as a hinge for one elbow conduit fitting and tightening the lock-nuts when the adjustable bracket is in its fixed position, the bracket remains rigid despite the heavy jar. The wiring from the lower pull box, through these fittings and directly into the lamp socket, was with No. 14 flexible wire.

The installation was made by the T and T Electric Company of San Francisco.

Table 7

Corresponding Pressures and Velocities of Dry Air at 70° and 29.92″ Barometer

Inches of Water	Ounces per Square Inch	Velocity Feet per Minute	Inches of Water	Ounces per Square Inch	Velocity Feet per Minute
.05	.0289	896	4.77	2.750	8745
.10	.0577	1266	5.00	2.884	8943
.20	.1154	1791	5.20	3.000	9134
.25	.1443	2003	5.50	3.172	9392
.30	.1730	2193	6.00	3.460	9810
.40	.2308	2533	6.07	3.500	9864
.42	.2500	2637	6.50	3.749	10210
.50	.2884	2832	6.94	4.000	10545
.60	.3460	3102	7.00	4.037	10595
.70	.4041	3351	7.50	4.326	10968
.75	.4326	3468	7.80	4.500	11187
.80	.4614	3582	8.00	4.614	11328
.87	.5025	3729	8.67	5.000	11792
.90	.5190	3800	9.00	5.190	12015
1.00	.5768	4006	9.54	5.500	12367
1.25	.7209	4478	10.00	5.788	12695
1.30	.7500	4566	10.40	6.000	12915
1.50	.8650	4905	11.00	6.344	13282
1.73	1.0000	5273	11.27	6.500	13445
1.75	1.0092	5298	12.00	6.921	13875
2.00	1.1535	5664	12.14	7.000	13950
2.17	1.2500	5895	13.00	7.497	14440
2.25	1.2975	6007	13.87	8.000	14913
2.50	1.4418	6332	14.00	8.074	14985
2.60	1.5000	6457	15.00	8.650	15510
2.75	1.5830	6641	15.61	9.000	15820
3.00	1.7300	6937	16.00	9.227	16020
3.03	1.7500	6976	17.00	9.805	16513
3.25	1.8740	7220	17.34	10.000	16675
3.47	2.0000	7457	18.00	10.380	16990
3.50	2.0185	7492	19.00	10.980	17456
3.75	2.1630	7756	19.07	11.000	17488
3.90	2.2500	7910	20.00	11.535	17910
4.00	2.3070	8010	20.81	12.000	18265
4.25	2.4510	8256	22.54	13.000	19012
4.34	2.5000	8337	24.28	14.000	19730
4.50	2.5950	8496	26.01	15.000	20420
4.75	2.7395	8729	27.74	16.000	21060

THE velocity of suction pressure to be maintained at the receiving hoods will determine the speed of the exhauster. In moving shavings or sawdust a 3,600 to 4,000-ft. velocity is the average requirement and this corresponds approximately to ⅞ or 1-in. pressure. (Table 7.) For planing mills the velocity head is usually 1 in. Laws in several of the states now specify the speed at which emery dust shall be moved, but 2-in. suction is usually sufficient. After the "hood suction" has been determined the friction losses of the entire duct system must be added thereto in order to determine the operating pressure at the fan. The operating pressure of the exhauster therefore must equal:

Pipe friction losses, plus
Collector hood losses, plus
Intake and discharge losses, plus
Pressure due to velocity.

Take as a typical example a planing mill piping system having three 7-in. branch pipes, three 6-in. branch pipes, two 5-in. branch pipes and one 4-in. branch pipe. Let us say the longest run of pipe on the suction side is 57 ft.; that there are three right-angle bends in this run, and that the radius of the elbows is equal to twice their diameter. To complete the set-up let us assume that a fan discharges the conveyed materials into a collector located 60 ft. from the fan, and that the discharge line contains one right-angle elbow.

If we add up the areas of the branch pipes we find that the main suction pipe will be 18 in. in diameter. Referring to our data of friction losses, the loss in 55 diameters of pipe equals one velocity head. Therefore 57 ft. of suction and 60 ft. of discharge piping (1½-ft. diameter) is equivalent to:

$$\frac{57 + 60}{1\frac{1}{2}} = 78 \text{ diameters}$$

Four elbows (each equivalent to 10 diameters) equals 40 diameters.

$$\frac{78 + 40}{55} = 2.15 \text{ velocity heads}$$

Intake+discharge loss = 1.50 velocity heads
Loss in collector = 1.00 velocity heads

Total operating head = 4.65 velocity heads
Assume 4,000 ft. velocity required, corresponding to a pressure of 1 in. (Table 7.)

Necessary operating pressure of exhauster $= 4.65 \times 1.0 = 4.65$ in.

Determining *Speed* and *Power* of Blowers

By J. R. WILSON, Quality Electric Works, Los Angeles.

Electrical Estimating Series XLIII

Tables 8 and 9 give data on one of the best known and most widely used makes of exhausters. As these tables cover a typical class of high efficiency fans we will use this data in solving our typical problem. From these tables we will select an exhauster having an 18-in. diameter inlet, or the 45-in. size. If we choose the slow-speed type we find that for 4-in. pressure the speed would be 658 r.p.m. and the power required 5 hp. (See Tables 10 and 11.) But as the static pressure is higher than the above figure (4.65 in.), further calculation will be necessary to get the correct result.

The speed will be $658 \sqrt{\frac{4.65}{4.00}} = 710$ r.p.m.

The power will be $5.00 \sqrt{\left(\frac{4.65}{4.00}\right)^3} = 6.28$ hp.

If the standard exhauster is used (instead of the slow-speed type) the speed will be 1,075 r.p.m. and the power will be 8.05 hp. The power as stated would be maximum, that is, the amount required when all the branch pipes are open. This would not be necessary in pattern shops, as all the machines are seldom used at once. Of course, as less

Table 8

Standard Steel Plate Mill Exhausters
Open Wheel

Exhauster			Suction Branches		VELOCITY THROUGH BRANCH SUCTION PIPES IN FEET PER MINUTE																	
	Inlet and Outlet				2500			3000			3500			4000			4500			5000		
SIZE	Diameter	Area Sq. In.	Area Sq. In.	Equivalent Diameter	A. P. M.	R. P. M.	H. P.	A. P. M.	R. P. M.	H. P.	A. P. M.	R. P. M.	H P	A. P. M.	R. P. M.	H P	A. P. M.	R. P. M.	H. P.	A. P. M.	R. P. M.	H P.
25″	19″	79	50	8″	875	1525	.79	1050	1830	1.36	1225	2135	2.15	1400	2440	3.22	1575	2745	4.58	1750	3050	6.29
			79	10″	1362	1490	1.06	1635	1780	1.80	1910	2085	2.90	2180	2385	4.33	2450	2680	6.15	2720	2980	8.45
			113	12″	1965	1575	1.63	2360	1890	2.80	2750	2205	4.42	3150	2520	6.62						
30″	12″	113	79	10″	1382	1185	1.03	1635	1421	1.79	1910	1660	2.84	2180	1898	4.23	2450	2135	6.05	2720	2370	8.30
			113	12″	1965	1188	1.36	2360	1425	2.38	2750	1663	3.80	3150	1900	5.63	3540	2138	8.02	3940	2375	11.00
			154	14″	2660	1246	1.97	3190	1495	3.40	3720	1745	5.41	4250	1992	8.07						
35″	14″	154	113	12″	1965	973	1.33	2360	1166	2.28	2750	1360	3.62	3150	1555	5.42	3540	1750	7.75	3940	1943	10.60
			154	14″	2660	982	1.73	3190	1178	2.98	3720	1375	4.75	4250	1570	7.05	4780	1769	10.00	5320	1965	13.85
			201	16″	3463	1025	2.35	4160	1230	4.06	4890	1435	6.45	5540	1640	9.65	6225	1845	13.70			
40″	16″	201	154	14″	2660	820	1.65	3190	984	2.84	3720	1148	4.50	4250	1310	6.70	4780	1475	9.55	5320	1638	13.00
			201	16″	3463	833	2.10	4160	1000	3.64	4890	1167	5.78	5540	1333	8.62	6225	1500	12.35	6930	1667	16.90
			254	18″	4430	872	2.85	5310	1045	4.90	6200	1220	7.85	7080	1394	11.72	7960	1568	16.52			
45″	18″	254	201	16″	3463	705	1.97	4160	846	3.41	4890	987	5.41	5540	1128	8.10	6225	1269	11.50	6930	1410	15.80
			254	18″	4430	723	2.56	5310	867	4.42	6200	1010	7.00	7080	1155	10.50	7960	1300	15.00	8850	1443	20.50
			314	20″	5450	756	3.36	6550	907	5.80	7650	1058	9.20	8730	1210	13.80	9820	1360	19.55	10900	1511	26.90
50″	20″	314	254	18″	4430	622	2.42	5310	746	4.19	6200	870	6.62	7080	995	9.90	7960	1119	14.05	8850	1242	19.35
			314	20″	5460	638	3.05	6550	766	5.28	7650	894	8.32	8730	1020	12.45	9820	1148	17.55	10900	1275	24.20
			380	22″	6600	665	3.86	7920	798	6.70	9220	931	10.55	10570	1064	15.9	11890	1198	22.55	13200	1330	31.00
55″	22″	380	314	20″	5460	556	2.86	6550	667	4.95	7650	779	7.81	8730	890	11.70	9820	1000	16.70	10900	1112	23.00
			380	22″	6600	572	3.54	7920	686	6.10	9220	801	9.75	10570	915	14.5	11890	1030	20.60	13200	1143	28.25
			452	24″	7850	594	4.45	9450	713	7.72	11000	831	12.30	12550	950	18.2	14150	1069	26.00	15750	1188	35.75
60″	24″	452	380	22″	6600	500	3.32	7920	600	5.75	9220	700	9.15	10570	800	13.65	11890	900	19.45	13200	1000	26.50
			452	24″	7850	514	4.00	9450	616	6.95	11000	719	11.00	12550	822	16.50	14150	925	23.50	15750	1028	32.10
			531	26″	9190	534	5.00	11100	640	8.65	12900	747	13.75	14700	854	20.50	16500	961	29.35	18400	1070	40.50
70″	28″	616	531	26″	9190	420	4.39	11100	504	7.55	12900	588	12.00	14700	671	18.0	16500	756	25.55	18400	840	35.00
			616	28″	10650	433	5.30	12800	520	9.18	14950	606	14.50	17100	692	21.6	19200	779	30.80	21400	865	42.00
			707	30″	12250	447	6.32	14700	536	11.00	17150	625	17.30	19600	715	26.0	22100	805	37.05	24600	894	50.70
80″	32″	804	707	30″	12250	360	5.56	14700	433	9.70	17150	505	15.35	19600	578	22.9	22100	649	32.50	24600	720	44.50
			804	32″	13900	369	6.55	16700	443	11.35	19500	516	18.00	22200	590	26.8	25000	664	38.00	27800	738	52.40
			908	34″	15750	383	7.85	18900	459	13.50	22100	536	21.50	25200	612	32.0	28300	689	45.80	31500	765	62.60

Note. Tables are computed with 200 ft. of suction and discharge piping and a collector. The diameter of main discharge pipe is in each instance assumed of same area as the fan outlet. For each additional 10 ft. of suction or discharge piping, the speed should be increased approximately 1 per cent and the power will be increased approximately 3 per cent. If a collector and elbows are included in the system the length of pipe to which they are equivalent must be added to the actual length, in order to determine the total equivalent operating length from which speed and power may be figured. If the total operating length is less than 200 ft. the speed should be decreased approximately 1 per cent for each 10 ft., and the power will be decreased approximately 3 per cent. For double fans, power and air handled will be doubled, speeds the same as single fans.

air is handled, less power would be required.

Tables 10 and 11 have been compiled with velocity as a basis and will be found more convenient in computing speeds and powers than the foregoing method, and for all practical purposes will be found accurate enough. These tables are based upon 200 ft. of suction and discharge piping and a collector, and corrections must be made for other lengths. If we assume the same conditions as in the previous examples, we have:

Length of suction and discharge piping = 117 ft.
Length of pipe equivalent to 4 elbows = 4 × 10 = 40 diameters
40 diameters × 1½ = 60 ft.
Total equivalent length = 177 ft.

As stated, the tables are based on 200 ft., so we have to make a correction for 23 ft. We must decrease the speed 1 per cent for each difference of 10 ft., or 2 per cent in this instance. Also decrease the power three times two, or 6 per cent in this instance. Therefore, from Tables 10 and 11 we get:

Slow-speed exhauster:
Speed 758 × .98 = 743 r.p.m.
Power 7.97 × .94 = 7.50 hp.

Standard exhauster:
Speed 1155 × .98 = 1132 r.p.m.
Power 10.5 × .94 = 9.88 hp.

These tables also will be found very convenient in determining power requirements when using a fan whose inlet is larger or smaller than the sum of the branch pipe areas. To illustrate, we will take a mill where a larger fan and duct are installed, to provide for future expansion; for instance, a 50-in. exhauster with 20-in. suction and discharge pipe. We will assume that the present branch pipes are the same as given in the previous example. From Tables 10 and 11 we find that:

50-in. slow-speed exhauster:
Speed 664 × .98 = 650 r.p.m.
Power 7.93 × .94 = 7.46 hp.

50-in. standard exhauster:
Speed 995 × .198 = 975 r.p.m.
Power 9.90 × .94 = 9.30 hp.
(with 18-in. equivalent diameter of branches.)

Table 9

Slow Speed P. M. X. Fans (Flanged Wheel)

SIZE	Exhauster Inlet Diameter	Exhauster Inlet Area Sq. In.	Exhauster Outlet Size	Exhauster Outlet Area Sq. In.	Suction Branches Area Sq. In.	Suction Branches Equivalent Diameter	VELOCITY THROUGH BRANCH SUCTION PIPES IN FEET PER MINUTE 2500 A.P.M.	2500 R.P.M.	2500 H.P.	3000 A.P.M.	3000 R.P.M.	3000 H.P.	3500 A.P.M.	3500 R.P.M.	3500 H.P.	4000 A.P.M.	4000 R.P.M.	4000 H.P.	4500 A.P.M.	4500 R.P.M.	4500 H.P.	5000 A.P.M.	5000 R.P.M.	5000 H.P.
23"	10"	79	Same as Inlet	81	50	8"	875	1056	0.70	1050	1270	1.22	1225	1480	1.93	1400	1690	2.87	1575	1900	4.10	1750	2120	5.69
					79	10"	1362	990	0.85	1635	1188	1.46	1910	1385	2.32	2180	1582	3.47	2450	1780	4.92	2720	1980	6.80
					113	12"	1965	1010	1.21	2360	1210	2.09	2750	1410	3.30	3150	1612	4.92						
30"	12½"	123		116	79	10"	1362	817	0.90	1635	980	1.55	1910	1142	2.46	2180	1305	3.68	2450	1470	5.25	2720	1632	7.20
					113	12"	1965	783	1.08	2360	940	1.87	2750	1095	2.96	3150	1252	4.45	3540	1409	6.30	3940	1565	8.65
					154	14"	2660	800	1.46	3190	960	2.54	3720	1120	4.02	4250	1280	6.00						
35"	14½"	169		157	113	12"	1965	660	1.13	2360	792	1.95	2750	924	3.10	3150	1054	4.60	3540	1187	6.52	3940	1319	8.98
					154	14"	2660	646	1.35	3190	775	2.32	3720	905	3.70	4250	1032	5.50	4790	1161	7.80	5320	1290	10.70
					201	16"	3490	658	1.75	4200	790	3.04	4890	921	4.80	5540	1052	7.15	6280	1185	10.25			
40"	16½"	218		206	154	14"	2660	551	1.38	3190	661	2.34	3720	772	3.72	4250	882	5.55	4790	993	7.90	5320	1100	10.75
					201	16"	3490	547	1.63	4200	656	2.80	4890	766	4.49	5540	875	6.65	6280	985	9.50	7000	1092	13.00
					254	18"	4430	560	2.14	5310	672	3.89	6200	783	5.81	7080	895	8.70	7980	1008	12.40			
45"	18½"	272		258	201	16"	3490	474	1.63	4200	569	2.81	4890	664	4.48	5540	758	6.65	6280	853	9.50	7000	948	13.00
					254	18"	4430	474	1.95	5310	569	3.35	6200	664	5.32	7080	758	7.97	7980	853	11.40	8850	948	15.60
					314	20"	5450	485	2.50	6550	582	4.31	7650	678	6.85	8730	775	10.20	9820	872	14.50	10900	970	20.00
50"	20½"	335		320	254	18"	4430	415	1.95	5310	498	3.35	6200	581	5.35	7080	664	7.93	7980	746	11.30	8850	830	15.50
					314	20"	5450	416	2.30	6550	500	3.98	7650	583	6.30	8730	667	9.45	9820	750	13.35	10900	834	18.50
					380	22"	6600	427	2.88	7920	513	5.00	9250	598	7.90	10570	684	11.80	11890	769	16.80	13200	855	23.15
55"	22¼"	406		387	314	20"	5450	369	2.26	6550	443	3.91	7650	516	6.20	8730	590	9.28	9820	665	13.25	10900	738	18.10
					380	22"	6600	371	2.73	7920	445	4.71	9250	520	7.55	10570	593	11.15	11890	668	16.00	13200	741	21.90
					452	24"	7850	380	3.25	9450	456	5.65	11000	532	8.95	12550	608	13.45	14150	684	19.00	15750	760	26.30
60"	24¾"	480		480	380	22"	6600	332	2.64	7920	399	4.58	9250	465	7.25	10570	532	10.80	11890	598	15.45	13200	665	21.20
					452	24"	7850	335	3.10	9450	403	5.40	11000	470	8.55	12550	537	12.70	14150	604	18.05	15750	671	24.80
					531	26"	9250	343	3.70	11100	411	6.40	12900	480	10.20	14700	549	15.20	16500	617	21.55	18400	685	29.50
70"	28¾"	649		621	531	26"	9250	275	3.37	11100	330	5.81	12900	385	9.25	14700	440	13.92	16500	495	19.65	18400	550	27.00
					616	28"	10650	279	3.96	12800	335	6.88	14950	391	11.00	17100	447	16.35	19200	503	23.30	21400	559	31.90
					707	30"	12250	286	4.70	14700	342	8.09	17100	400	13.00	19600	457	19.20	22100	514	27.30	24600	570	37.50
80"	32¾"	840		808	707	30"	12250	238	4.29	14700	284	7.45	17100	330	11.75	19600	378	17.65	22100	425	25.00	24600	473	34.50
					804	32"	13900	240	4.92	16700	288	8.52	19500	336	13.50	22200	384	20.20	25000	432	28.80	27800	480	39.40
					908	34"	15750	245	5.75	18900	294	10.00	22100	343	15.85	25200	392	23.60	28300	441	33.60	31500	490	46.20

Table 10

Slow Speed P. M. X. (Flanged Wheel)

Capacities Under Normal Working Conditions—Air at 70° F. and 29.92" Bar.

Size	1" Static Pressure or 0.577 Ounces R.P.M.	A.P.M.	H.P.	2" Static Pressure or 1.154 Ounces R.P.M.	A.P.M.	H.P.	3" Static Pressure or 1.734 Ounces R.P.M.	A.P.M.	H.P.	4" Static Pressure or 2.307 Ounces R.P.M.	A.P.M.	H.P.	5" Static Pressure or 2.884 Ounces R.P.M.	A.P.M.	H.P.
25	591	880	.19	837	1260	.55	1024	1540	1.01	1182	1780	1.55	1322	1990	2.17
30	494	1280	.28	698	1815	.79	855	2220	1.45	988	2565	2.24	1104	2870	3.13
35	423	1740	.38	598	2465	1.07	733	3020	1.97	846	3493	3.03	947	3900	4.25
40	370	2275	.50	523	3220	1.40	641	3940	2.58	740	4550	3.98	827	5090	5.56
45	329	2880	.62	466	4070	1.78	570	4990	3.26	658	5760	5.00	737	6450	7.03
50	296	3555	.77	419	5030	2.20	513	6160	4.03	592	7120	6.20	662	7960	8.68
55	269	4300	.94	381	6100	2.67	466	7460	4.88	538	8620	7.50	602	9635	10.5
60	247	5120	1.12	349	7250	3.17	427	8870	5.80	493	10250	8.93	551	11450	12.4
70	211	6975	1.51	299	9865	4.30	366	12070	7.88	422	13930	12.1	473	15580	17.1
80	185	9100	2.00	261	12880	5.56	320	15760	10.3	370	18200	15.9	413	20360	22.2
90	164	11520	2.49	233	16280	7.17	285	19960	13.1	329	23040	20.2	368	25800	28.2
100	148	14220	3.11	209	20120	8.78	256	24640	16.1	296	28480	24.9	330	31840	34.5

Size	6" Static Pressure or 3.460 Ounces R.P.M.	A.P.M.	H.P.	7" Static Pressure or 4.04 Ounces R.P.M.	A.P.M.	H.P.	8" Static Pressure or 4.614 Ounces R.P.M.	A.P.M.	H.P.	9" Static Pressure or 5.19 Ounces R.P.M.	A.P.M.	H.P.	10" Static Pressure or 5.768 Ounces R.P.M.	A.P.M.	H.P.
25	1448	2180	2.86	1563	2355	3.89	1672	2515	4.39	1772	2670	5.22	1868	2815	6.13
30	1249	3140	4.11	1307	3390	5.19	1397	3630	6.33	1480	3850	7.55	1562	4055	8.88
35	1038	4270	5.59	1120	4615	7.03	1197	4930	8.55	1270	5230	10.3	1338	5515	12.0
40	903	5575	7.30	978	6025	9.20	1046	6440	11.2	1110	6830	13.4	1170	7200	15.8
45	805	7060	9.20	871	7625	11.6	931	8150	14.2	987	8650	16.9	1041	9120	19.8
50	725	8720	11.4	783	9420	14.4	837	10070	17.5	888	10680	21.0	935	11250	24.4
55	660	10550	13.9	712	11400	17.4	762	12180	21.3	807	12930	25.4	851	13620	29.7
60	604	12550	16.4	652	13560	20.7	696	14500	25.2	739	15370	30.2	779	16200	35.3
70	517	17070	22.3	559	18430	28.2	597	19700	34.3	633	20900	40.8	669	22050	48.0
80	453	22300	29.2	489	24100	36.8	523	25760	44.8	555	27320	53.6	585	28800	63.2
90	403	28210	38.8	435	30500	46.6	465	32600	56.8	493	34600	67.8	520	36480	79.6
100	362	34980	48.7	391	37680	57.3	418	40280	70.0	443	42720	83.3	467	45000	97.8

It will be seen that the power is less than for the 45-in. exhauster. This is due to the decreased friction in the 20-in. duct against the 18-in. size. This permits a slower speed and pressure, but of course increases the first cost for installation.

Blast Gates

Blast gates should be used in every branch pipe connected to a blower system. They save handling useless air, thereby reducing the consumption of power. They also increase the efficiency of the system because the suction is increased in those branches which are in use if the "dead" branches are shut off when not needed. Care must be taken to see that the openings in the blast gates are full pipe size so that friction is not increased at these points. The frames of these blast gates are usually made of heavy cast-iron and the gates of heavy-gage steel plate.

Table 11

Standard P. M. X. (Open Wheel)

Capacities Under Normal Working Conditions—Air at 70° F. and 29.92" Bar.

Size	1" Static Pressure or 0.577 Ounces R.P.M.	A.P.M.	H.P.	2" Static Pressure or 1.154 Ounces R.P.M.	A.P.M.	H.P.	3" Static Pressure or 1.734 Ounces R.P.M.	A.P.M.	H.P.	4" Static Pressure or 2.307 Ounces R.P.M.	A.P.M.	H.P.	5" Static Pressure or 2.884 Ounces R.P.M.	A.P.M.	H.P.
25	898	890	.25	1270	1260	.70	1555	1540	1.29	1795	1780	1.98	2008	1990	2.78
30	747	1280	.36	1058	1815	1.01	1294	2220	1.85	1495	2565	2.85	1672	2870	3.98
35	640	1740	.48	905	2465	1.37	1109	3020	2.52	1280	3485	3.88	1430	3900	5.42
40	561	2275	.64	793	3220	1.79	972	3940	3.30	1122	4550	5.09	1255	5090	7.12
45	499	2880	.80	706	4070	2.27	865	4990	4.17	998	5760	6.44	1117	6450	8.98
50	449	3555	.99	635	5030	2.80	778	6160	5.15	898	7120	7.95	1004	7960	11.1
55	408	4300	1.20	578	6100	3.39	707	7460	6.23	816	8620	9.62	913	9635	13.4
60	374	5120	1.43	529	7250	4.04	648	8870	7.42	748	10250	11.4	836	11450	16.0
70	321	6975	1.94	453	9865	5.50	555	12070	10.1	640	13930	15.6	715	15580	21.7
80	281	9100	2.54	397	12880	7.79	486	15760	13.2	561	18200	20.4	628	20360	28.5
90	249	11520	3.21	353	16280	9.09	432	19960	16.7	499	23040	25.8	558	25800	36.0
100	225	14220	3.96	318	20120	11.2	389	24640	20.6	449	28480	31.8	502	31840	44.3

Size	6" Static Pressure or 3.460 Ounces R.P.M.	A.P.M.	H.P.	7" Static Pressure or 4.04 Ounces R.P.M.	A.P.M.	H.P.	8" Static Pressure or 4.614 Ounces R.P.M.	A.P.M.	H.P.	9" Static Pressure or 5.19 Ounces R.P.M.	A.P.M.	H.P.	10" Static Pressure or 5.768 Ounces R.P.M.	A.P.M.	H.P.
25	2290	2180	3.66	2375	2355	4.61	2540	2515	5.62	2693	2670	6.70	2840	2815	7.80
30	1830	3140	5.23	1978	3390	6.60	2115	3630	8.06	2240	3850	9.62	2365	4055	11.2
35	1588	4270	7.12	1693	4615	8.97	1810	4930	10.9	1920	5230	13.1	2026	5515	15.3
40	1373	5575	9.33	1483	6025	11.8	1587	6440	14.4	1683	6830	17.2	1773	7200	20.07
45	1223	7060	11.8	1322	7625	14.9	1413	8150	18.1	1498	8650	21.7	1578	9120	25.36
50	1100	8720	14.6	1188	9420	18.4	1270	10070	22.4	1347	10680	26.7	1420	11250	31.3
55	1000	10550	17.6	1080	11400	22.2	1154	12180	27.1	1224	12930	32.4	1290	13620	37.87
60	915	12550	20.9	989	13560	26.4	1058	14500	32.3	1120	15370	38.5	1183	16200	45.1
70	780	17070	28.5	847	18430	35.8	905	19700	43.6	960	20900	52.5	1013	22050	61.2
80	687	22300	37.3	742	24100	47.2	794	25760	57.5	842	27320	68.7	887	28800	80.3
90	611	28240	47.2	661	30500	59.5	706	32600	72.7	749	34600	86.8	789	36480	101.5
100	550	34880	58.2	595	37680	73.3	636	40280	89.6	674	42720	107.0	710	45000	125.2

Better Merchandising

New Year "Platform" for the Retail Dealer

Another Article on Merchandising Trends Which Concern Every Type of Retail Selling to Meet New Competitive Conditions

THE FORCE and character of selling effort required to meet conditions in the next two years is not so much a question of hitting hard for sales as it is of hitting properly and squarely.

I mean by this that the retailer more than ever has to aim his selling plans more accurately at present-day buyer psychology. He has to make every advertising dollar bring in a fair return. Every display and payroll dollar must do likewise. Misdirected effort due to inexperience or enthusiasm, is getting to be more costly right along for the retail merchant.

The major factors in future retail selling will be:

(a) Advertising.
(b) Display.
(c) Counter or floor selling.

It can be said, with truth, that 90 per cent of the most successful retailers in this country are regularly budgeting their selling costs and are **concentrating** their selling efforts as a means of making sales costs square with turnover. Why a greater percentage of retailers in general fail to do this it is hard to understand. The need grows greater every year with the increase in competition, the fluctuations of sales and profits over seasons and over years.

There is a certain percentage which the retail merchant can lay out for sales promotion. He is taking chances when he spends less than this percentage or when he spends more. The old style way of spending lavishly on advertising now and then, an occasional splurge as a means of livening up a dull business, will not do in the future. A more consistent and sound program is the only safe one.

Avoid This Waste

A good many retailers without great experience feel that the outlay of heavy money for a sales promotion campaign will, by its very size, move the goods.

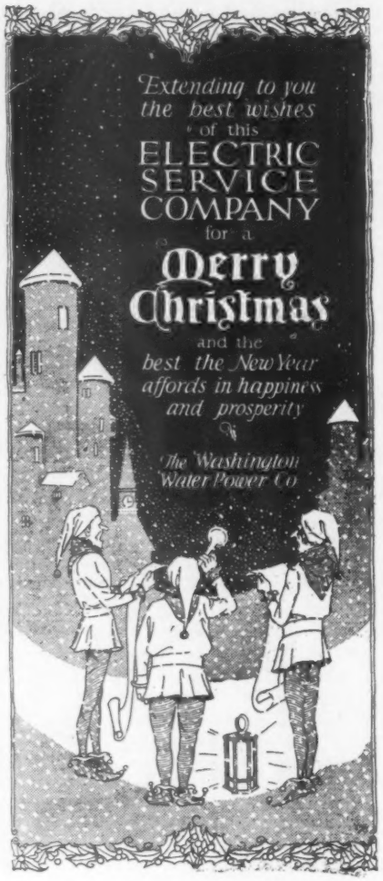
The result is that the money is very apt to be spent at a time when conditions will not permit such a return. In future, the progressive merchant will spend his sales promotion money:

(a) At the right time;
(b) In the right way, and
(c) In right quantity—based upon sales volume of the three previous years or seasons and in accordance with the ratio increase in gross revenue.

By E. J. CLARY
Merchandising Consultant

The commonly heard phrase, "Scientific retailing," sounds much more ponderous than it really is. One of the most successful chain store groups considers that it operates strictly on a "scientific basis," yet the general manager of this chain said recently to this writer:

A Holiday Greeting



Attractive greeting advertisement of a public utility.

"Scientific retailing merely consists of getting the right goods, at the right price, at the right time, before the right people and in the right way. That's all there is to it."

This simple formula, of course, has behind it a great deal more than that. It is necessary to know who the right people are, what the right price is, what the right way to show the goods may be and just what the right price happens to be. It also is necessary to discover the right time.

These factors can only come from a close study of conditions today plus experience in the past.

In connection with the all-important question of selling in the next two years or so, one thing is especially outstanding. In a great many lines of business, conservative retailers are inclined more and more to work into the cut-price groups—the chain and department store groups.

Experience has shown that it is not enough merely to slash prices in order to get volume. **The average, well established independent cannot compete with the cut-price groups for the reason that they have many advantages over him and can beat him hands down.**

It has to be remembered that a heavy volume of cut-price trade raises overhead and selling costs in ratio to the increase of the volume and here is where the multiple unit or the department store organization can beat the independent.

Build for Permanent Trade

Probably the best advice that can be given the retailer for the period lying just ahead comes from the general manager of a large Chicago store, who said:

"The small retailer will do well to build for permanent trade in the next few years. The cut-price groups have their place and there will be more of them. But the conservative retailer who applies efficient management to his business will come out best by getting right prices for his goods and taking a fair profit on them, instead of trying to get volume on small margins, which he is not organized to do."

It is obvious that the most successful retailers in future will adopt definite sales and buying methods and stick to

them. Enough advantages are offered the public by the progressive independent, as against cut price chains and big stores, to hold and retain the great bulk of the retail trade in this country. It is a fact that only a portion of the American public buys on price alone and never before has **quality** and **service** been more in demand than it is today.

Display Supplants Advertising

In connection with the display of merchandise, I would like to point out one thing: the art of display is the keystone of present-day retail selling. Display, to a great degree, has supplanted press advertising in independent retailing circles.

The show window never had the dollar value that it will have in the near future—that it has even today.

There are many reasons for this. One is the ever increasing values given in merchandise from the display standpoint. Another is the **improved illumination** and design of window space. A third is the really excellent quality of setups being supplied by manufacturers and jobbers.

An awakening to the possibilities of training sales people was one of the outstanding features of retail merchandising in 1928. It is safe to predict that we are just on the eve of a vast movement in this direction. Many methods have been adopted to achieve this end. It is predicted that most of them will be made available to the small retail business as well as the big in two or three years.

Trained Help Wins

The retailer who hires competent help, trains his help and inspires his sales people to sell, will be the winner in future. In every line, in all parts of the country I find merchants awake to the possibilities of personal selling and seeking the advantages of it by paying better wages and offering greater bonus inducements.

We are on the eve of a really serious and nationwide move along the lines of retail sales training. The time is not far distant when a retail seller will have to study and master his or her profession just as an auditor or typist must do now.

This movement already has made great strides in the past three years, notably among the department store people where lectures, the picture screen and demonstrations teach and inform.

The trouble is that such facilities are not widely available to the small retailer—the man with three or four people. And that is just where this training is needed most. It is needed most for the reason that the big store can rely upon crowds of shoppers for its sales, while the small independent must depend upon customers. Hence, the necessity for a greater sale unit holds good in the small business.

Through his trade association, however, this educational work may be made available, very often, to the independent dealer. When such opportunities are available no wise retailer will allow them to slip by.

I find on every hand higher wages for clerks and a tendency to advance them still farther in the next year. Merchants admit that this policy has a direct influence on sales.

Sales people are required to know the goods, show the goods and sell the goods.

In summing up, therefore, a good "platform" for the small retail dealer might well read:

1. Conservation in financial matters.
2. Budgetary control of selling costs.
3. Trained sales people, well paid.
4. Concentration on staple stocks.
5. Adoption of a clear-cut merchandising policy.

"Electricity is Cheap, Use More of It"

This talk by Evelyn M. Searl of the Southern Sierras Power Company won honorable mention in the three-minute speaking contest held at the P.C.E.A. convention at Pasadena in June. Because of the excellent selling points for the use of electricity contained in the speeches ELECTRICAL WEST has been publishing one of the talks in each issue beginning last August.

Tasks could be done electrically.

AMERICA'S prosperity, the envy of all countries of the world, is a result of great initiative and consequent industrial supremacy. And out of industry has come the evolution of electricity, the basic element of that prosperity America enjoys.

This is the era of electrical power, the greatest economic factor—stronger than any other element—and since its inception less than half a century ago the development of electricity has been almost phenomenal. There seems to be no limit to its possibilities of service to mankind. Already there are about 3,000 uses and some 20,000 different electrical machines, devices and appliances. And as long as there remain tasks being done by manpower which **could** be done electrically, so will its development continue!

Electric service is now recognized not as a luxury, but as an indispensable and inexpensive necessity in home, business, factory and farm. There is no field of industry which has not benefited. What could we do, what would we be, without it? Think of the unspeakable disaster if the sudden elimination of the kilowatt should occur!

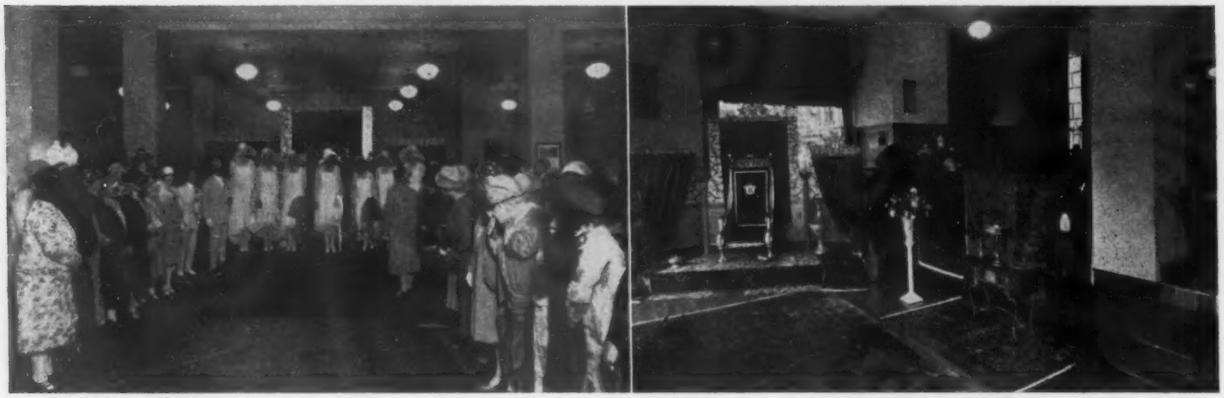
Disaster in kilowatt elimination.

Because electric service gives the best in safety, convenience and economy, its new work has been spread to every community. And now the kilowatt is moving to the country where the farmer and his wife are rapidly realizing the economy of electrified labor. They, too, can now enjoy the same advantages as do other occupations, since numerous phases of their burdensome toil have been reduced to the pulling of a switch or the pushing of a button. What better proof of its economy than its welcome and widespread use in rural districts?

The greatest problem of the public utility today is how best to educate the community to more fully appreciate and understand the economic value of electric service. It is cheaper now than in 1913, while the average increase of all other commodities has been 65 per cent since the war. How many of you know that the entire bill of the nation is less than that for confections and tobacco, while the cirgarette alone is 50 per cent **more?** In reality, electric service is the smallest item in the family budget, the average cost being only 8 cents per day.

Through this great gift of electric service to mankind has come the greater humanization of industry, creating something fine and splendid in American life. For increased production has increased the working man's earnings. So we have the chain of Power, Production and Prosperity. From more leisure, which affords the widening of opportunities for higher standards of living, self-improvement, knowledge, cultural and spiritual advantages, has evolved a greater social advancement, developing our nation, making America supreme in the progress and promotion of civilization.

Civic Ceremony Serves as Window Display Attraction



Participation by the local power company in civic affairs is exemplified by the accompanying photographs showing a public reception tendered to "Queen Elise" of the Portland Rose Festival in June, by the Portland Women's Research Club, in the salesroom of the Northwestern Electric Company in the new Public Service Building. Only a few of the hundreds who greeted the Queen and her attendants at this reception are shown above. The spacious sales room with its finely appointed furniture, its beautiful lighting, and its special decorations for the occasion was packed for three hours.

For a week prior to the reception, the company had given publicity to the event by the window display shown.

Incidentally, O. B. Coldwell, vice-president, Portland Electric Power Company, was president of the Rose Festival Association for 1928. Both companies were interestingly represented in the two parades with elaborate floral floats.

National Plan Book on Electric Cookery

Following the lead established in Pacific Coast and Northwestern territories in the selling of electric ranges, the National Electric Light Association, domestic electric range committee, Commercial National Section, and the Range and Water Heating Section, National Electrical Manufacturing Association, working through the Society for Electrical Development, have issued a plan book entitled "The Plan to Sell Electric Cookery."

The book is of large magazine size and contains a number of samples of literature available for use in electric range campaigns. The plan begins with evidence to show the load value of electric range business and its desirability.

The plan is based on four "planks" namely:

1. Sell electric cookery idea to your public continuously;
2. Make day-to-day selling of ranges an important part of all the year 'round merchandising activities;
3. Conduct one or more intensive short term selling campaigns each year;
4. Define policies and establish conditions favorable to help the growth of the business.

The public education factor is approached by means of a number of advertising suggestions, copies of promotional literature, direct mail pieces, etc. Methods of campaign procedure are next taken up.

The plan urges very strongly complete co-operation with contractors and dealers and the advertising of the fact that such dealers participate in the campaign with the power company.

Information as to the plan as well as regarding material for advertising or mailing is being made available through the S.E.D. headquarters, 420 Lexington Ave., New York City.

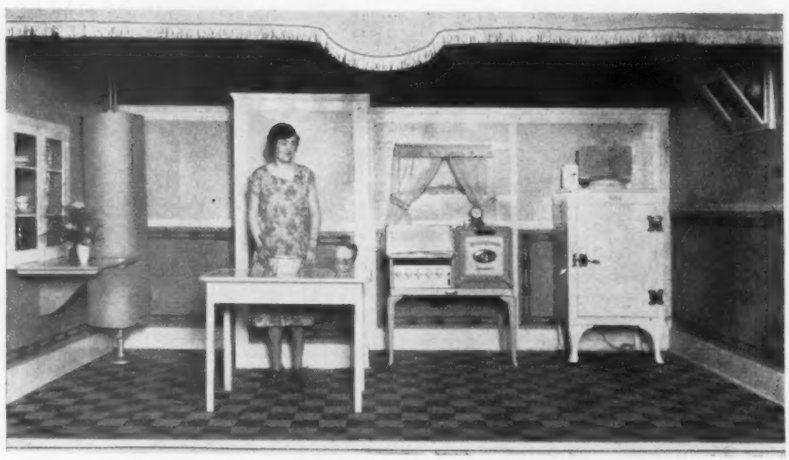
Portable Model Kitchen for Demonstrations

A MODEL kitchen which has been set up in the auditorium of the Utah Power & Light Company's store in Salt Lake City. In the picture is Miss Lulu Boyes, home economist, who conducts weekly cooking lectures and demonstrations sponsored by the Utah Power & Light Company in Salt Lake City, Ogden, Logan, Provo and occasionally in other towns in the company's territory. The kitchen shown above has just recently been equipped, on a more attractive and more convenient scale than formerly, and is used as the "stage" for the demonstrations in Salt Lake City.

These demonstrations, which have been conducted weekly for some time past, are very popular with the housewives, and at each session there is a large attendance of women. A different subject is used each week, and is announced in the local newspapers. Cards, on which the recipes to be demonstrated each week, are printed, and distributed free to all who attend these meetings. This form of advertising makes for future sales.

This program, which is conducted throughout the year, except during the hot weather season, is accomplishing very good results in educating the housewife in the use of the electric range, and also in assisting her to solve her cooking problems in general.

After each demonstration period questions are asked and answered. Miss Boyes presents her talks and demonstrations in a very comprehensive manner. She has a charming personality, and is making many friends for her company.



Clearing Slow Stocks *With January Sales*

Typical full-page advertisement used to clear out old lines employing a method long found of value by retail merchants everywhere.

"SPECIAL sales are resorted to by nearly all retail trades to get slow-moving stock into the hands of buyers. Mark-downs, as liberal as are required, are used. It might seem that the mark-down plan is the logical one for the central station to use, keeping its merchandise stock clean, but a drawback to this is its effect upon public relations. The central station wants to retain its standing with those institutions which work with it.

"We use the clearance idea here in Pueblo, and without detriment to relations with dealers, in a regular January sale. The January clearance sale is a recognized ethical event among the retail trades. Stores around us are holding such sales, and have for years. When we hold one, no one can object, for our purpose is one recognized by merchants as legitimate and confirmed by their own January clearance events."

The speaker was Ernest F. Stone, assistant general manager, Southern Colorado Power Company, Pueblo.

The company's January clearance sale has become an institution looked forward to by Pueblo bargain seekers. The routine of the sale, followed from year to year, is exactly like that of the January, 1928, sale, which will be described.

On Jan. 3 the company opened with "smash" advertisements six columns by full-page. Dominating all were the words "January Clearance." In prominent type below was "25 to 50 Per Cent Savings."

The company's whole line appeared in the presentation which followed. Cuts were used liberally of electric ranges, automatic washers, vacuum cleaners, percolator sets, toasters and so on. The advertising had straight bargain-appeal throughout, with former price and sale price contrasted.

To avoid disappointments common to clearance sales the copy in numerous cases stated the quantity available for sale. Thus there were six cookers of certain make, two battery eliminators of named manufacture, twenty cigar lighters, 30 standard-make curlers, one floor waxer, six ironers, 32 sweepers of named brand, 20 electric ranges of standard make, one electric dish-washer, two $50 hand decorated table lamps, etc. By properly stating quantities, the advertiser did two things—injected the appeal of limited quantity into the message, and avoided situations which would lead, if a customer did not find what she came seeking, to actual ill-will.

The advertisement described above was the opener, then two or three smaller advertisements were used each week during the remainder of the month. Each of these was the standard space taken by the company—three columns by ten inches. These follow-up insertions took first one, then another, line and gave it feature prominence. During the sale, special price tags were used, and the company's windows were used to bring customers into the store.

"The January clearance sale is a bona fide clearance event," Mr. Stone told the correspondent. "Its purpose is exactly what the name suggests—to get into the hands of buyers merchandise which has been too long in our stock, or is certain to stay too long. The purpose of the sale is to keep our stock clean. Our average mark-down on the 1928 sale was very little in excess of 25 per cent.

"Like most retail businesses, we have found it necessary for a well-balanced sale event to take certain items and make leaders of them—articles we don't need to use a mark-down on to move. The purpose of this, of course, is to give the public a sale it will get full satisfaction from. The mark-downs we use in this way, however, do not come to large totals; we use them with judgment and discrimination.

"We find there is an appeal in the bargain which is found in nothing else and price reductions bring in the people in great numbers."

As suggested earlier, a very essential feature of this January sale event is that it does not arouse the antagonism of the local electrical trade. A clearance event in January is granted by ethics of retailing to all businesses. Moreover an effort is made to have other electrical retailers likewise make use of this method to clear old stocks for the new year.

SPRING
Electric Range
OFFERING
WESTINGHOUSE
CRAWFORD
HOTPOINT
ELECTRIC
RANGES
FOR every working day of 1927, twenty-six of the homes served by our Electric Service were made far more enjoyable by the purchase of an approved Electric Range.
—The FIRST COST is most reasonable.
—The OPERATING COST is low.
—The COOKING RESULTS are Fast and Certain.
You too can enjoy your electric range and pay for it at your leisure. Our nearest office will gladly tell you how.
APPROVED
PUGET SOUND POWER AND LIGHT COMPANY

Opening broadside announcing the ranges to be featured in the sale.

Three-Point Attack Breaks Sales Resistance---*and All Records*

How the Puget Sound Company Sold 4,861 Ranges in 75 Business Days

BREAKING records in range campaigns is becoming a commonplace occurrence with the Puget Sound Power & Light Company, Seattle. Nevertheless, the fact that the company sold 4,861 ranges, including 2,807 to apartment houses, in 75 business days between April 1 and June 30 last year, representing another record, is a feat worth recording, as is the sale of 8,318 ranges in the first six months of 1928, against a quota for the year of 10,000. The saturation on the company's lines is now 24 per cent, and there are still some 80,000 customers yet to sell.

The range campaign was organized similarly to preceding campaigns, except that no premium or special term offers were made. Crawford, Hotpoint and Westinghouse ranges were featured and sold at somewhat less than list price. The regular sales department carried the burden primarily though employees outside this department were given an opportunity to assist. Districts were pitted against each other and competed for a first and second prize offered by the manufacturers.

A new idea in recording district competition was in organizing the campaign in the form of a baseball league. Each district was given its quota and, during each of the thirteen weeks except for one week in which a "bye" was drawn, was scheduled against one other district. Thus paired against each other in rotation there were three winners and three losers each week based on the percentages of quota sold by each that week. The district standing was kept in percentages like the "Standing of the Clubs" in a baseball league, the final standing being recorded as follows:

A particularly interesting feature of the campaign was the newspaper advertising copy. It was determined at the start that only three features of electric cooking need be stressed: (1) that the first cost is reasonable, (2) that the operating cost is low, and (3) that electric heat is fast and certain. An excellent series of ten advertisements for use in the newspapers in the territory during the campaign period was worked out in which these three ideas were reiterated in different ways. Particularly effective was the group of three pieces of copy which put the words into the mouth of a neighbor who had a range.

Interesting also was the line at the bottom of each ad, "Member Totem Broadcasters," a means adopted to draw attention to the fact that the company had been partly responsible for a number of excellent radio programs made available in the territory, thus attempting to cash in on the cost of such broadcasting.

The Three Points of Attack

1. **First Cost is Reasonable**
2. **Operating Cost is Low**
3. **Cooking is Fast and Certain**

Electric Range League Standings—June 30, 1928

	Quota	WINS Sold	%		Quota	LOSSES Sold	%
Eastern	100	39	39.0	Northern	200	35	17.5
Western	120	35	29.0	Southern	105	6	5.7
Northeastern	190	30	15.7	Southwestern	185	29	15.7
		Central (Bye)			233		

	No. Sold to June 26	4 Days June 30	Total Sold	% of Quota	W.	L.	%
Western	184	35	219	182.5	9	3	750
Central	720	233	953	158.8	6	6	500
Eastern	110	39	149	149	6	6	500
Northeastern	231	30	261	137.3	7	5	583
Northern	187	35	222	111	7	5	583
Southwestern	158	29	187	101	5	7	417
Southern	57	6	63	60	2	10	167
	1,647	407	2,054	136.9			
Apartment-house sales			2,807				
Total ranges sold			4,861				
Water heaters sold			423				

Estimated annual revenue at $40 each $211,369, for ranges and water heaters.

Fast--Certain
in Cooking Results
SNAP a switch—white-hot heat awaits your command—bid it rise or fall as you wish! Cook food deliciously... surely...with electrical speed!... These approved electric ranges—Crawford, Hotpoint and Westinghouse—give you steady, controlled heat that eliminates guesswork from your cooking.
SPRING ELECTRIC RANGE OFFERING
Our Spring Electric Range Offering affords you an opportunity to own one of our many models on surprisingly convenient terms. We invite you to inspect them at any of our stores. Come in today!
PUGET SOUND POWER AND LIGHT COMPANY

The Operating Cost
IS LOW
ELECTRIC ranges cook for over 22,000 customers of ours at an average of only ten or fifteen cents a day! They cook a large meal for a nickel. Cook it quickly and automatically, without the constant watching and hot kitchen that make old-fashioned cooking a drudgery. Cooking cost: one cent per meal for each person! Decidedly low!
SPRING ELECTRIC RANGE OFFERING
Visit any of our stores and inspect our Hotpoint, Westinghouse and Crawford Approved Electric Ranges—prices and terms to suit every housewife.
PUGET SOUND POWER AND LIGHT COMPANY

The First Cost
. . is Most Reasonable
YOUR electric range costs you a mere fraction of what it's worth to you! Only $10 down (a surprisingly small amount for so much cooking contentment)—the balance on easy terms. Once you buy a Westinghouse, Crawford or Hotpoint—you're satisfied. And after you've used one you'll never question the first cost!
You are invited to call at our nearest store and inspect these ranges in a wide variety of models that are sure to suit your individual taste.
PUGET SOUND POWER AND LIGHT COMPANY

How the three points were advertised.

At the start, shown above, hoses and pipe nozzles are run to fires started at several places about the stump, the pipes being moved occasionally to follow up and direct the fire. At the end, shown at right, the roots of the stump have been burned deep into the ground.

New Uses for Old Cleaners

A WIDE variety of odd or freak uses for vacuum cleaners, from catching flies on window panes to blowing fallen leaves off the front porch, have been brought forth by enterprising experiments, but one of the most freakish, yet highly practical, uses has recently come to light in western Washington where many logged lands are being turned into chicken ranches. This use is in connection with the generally expensive process of land clearing.

The simplest and cheapest way to get rid of the stumps, albeit the slowest and most tedious, is by burning. Frequently the stumps are partly rotted and fairly well saturated with moisture so that their resistance to fire is great, and the process of burning them depends on getting a draft of air to the fire to keep it alive and active. This is where the cleaner comes in.

The bag is removed and in its place is soldered a tin cap holding eight ½-in. tubes long enough to permit a ¾-in. hose to be slipped over them. The hose should be of different lengths, 10 to 25 ft., so that it can be carried to eight fires at varying distances from the cleaner. In the end of each hose is slipped a 4 to 8-ft. section of ½-in. pipe which is nozzled in close to the flame and moved forward periodically as the flame advances, as for instance when it follows the length of a long root.

Fires are then started around the stumps with kerosene, and, by the slight forced draft from the vacuum cleaner fan are made to undermine the stump completely and destroy the largest roots in far less time than would normally be possible with what natural draft might be induced through a system of chimneys drilled through the stumps or dug through the ground. It can be seen that this process leaves the top soil comparatively undisturbed and adds to it a small deposit of wood ash which is beneficial. It also eliminates the expense and labor involved in blasting.

To realize that this use of the vacuum cleaner is not as impractical as it sounds it is necessary to understand that much logged off land in western Washington lies adjacent to highways where distribution lines are available for rural electrification. The farmer sets up his buildings on a small portion of his land with the prospect of raising chickens while he is gradually clearing more and more land around his house for the extension of his operations. Two weatherproof wires twisted together form a sufficiently flexible and sturdy cord by which to connect the converted cleaner from an outlet at the house or barn, and permit the use of the cleaner as far as 500 ft. or more out across the fields from the point of connection.

An old cleaner fitted with tin cap and pipes for connecting hoses.

A VISIT not long ago to the sales room of the Cheyenne, Light, Fuel & Power Company, Cheyenne, Wyo., disclosed a dearth of table and floor lamps. There were not half a dozen in the sales room.

"Don't you folks sell any lamps up here?" I asked.

"Sure we do," was the reply. "We sell as many as anybody else in town."

"Then where's your stock?"

"All sold out. Got some more coming in."

And a dollar sale was the cause of it all.

"We had a bunch of lamps that were getting slightly shopworn," was the explanation. "And we decided we'd better get rid of them before our new stock came in. Therefore we conducted a dollar sale that went over so big that practically everything in the house was taken. It worked this way:

"We told the public that with every lamp purchased we'd give the purchaser another one of equal value for one more dollar. Thus if the customer bought a $15 lamp we'd sell her another $15 one for the price of $1. The idea went over big. Of course we did not always have a lamp exactly like the one purchased or of the exact price when the customer found a second lamp that suited her, so we made this sort of proposition: 'You pick out any two lamps on the floor that you want. We'll charge you the price of the highest priced lamp plus $1 for the two.'"

How to Keep Your Children at Home
Stop!
When some want Hotcakes
STOP!
—and others demand Waffles
—there's only one thing to do—get a
MAJESTIC Electric Hotcake and Waffle Iron
with its instantly reversible grids for making both Hotcakes and Waffles at the table
Only the
MAJESTIC
HOTCAKE & WAFFLE IRON
makes both
Reversible Grids
of simple twist of the wrist for either
Waffles or Hotcakes
Manufactured by MAJESTIC ELECTRIC APPLIANCE CO., INC., SAN FRANCISCO
Also Makers of THE FAMOUS MAJESTIC PORTABLE ELECTRIC HEATERS

Humor is used to good effect in this dealer-help ad. The waffle iron sells best when a human-interest appeal is made.

Keep the WAFFLE

By Selling Their of Mere Beauty

¶ *Sales are for the ingenious who can devise new and more fascinating uses for the ordinary reliable appliance.*

WAFFLES, in another season or two of just such intensive campaigning as that of the past few years should become as firmly rooted to the national appetite in February as the cherry tree and little red axe are associated with Washington's birthday, another February event of importance. When that day comes the electrical merchandiser may sit back in comfort and let the sales roll in, and time may even warp history a point and make it a waffle iron that the Father of his Country used to design the famous cherry waffle recipe then in vogue.

Until such time as active selling scrambles history and waffles in so delectable a combination, however, there is much pioneering to be done. The cause must be made before such a cherry or cheery effect can be expected. The **cause** calls for active and skilful salesmanship **right now.**

And Why Not the Cherry Waffle?

Just when the waffle iron seemed to be doomed to a Sunday morning breakfast load factor and to repine in the kitchen cupboard cold and uninteresting (to the power company) all the rest of the week some bright person conceived the masterpiece known as the strawberry waffle. That triumph has carried the waffle iron into bridge parties, after-theater and off-peak snacks, and just plain everyday usefulness. The waffle foundry made to fit every kitchen table and leave room to spare for the plates butter and jelly, has become a more universal piece of household furniture. And sales of the device have mounted thereby.

But it is far from being a national necessity even yet. Strawberries, except for a few favored spots in California, are not available fresh all months of the year. The strawberry waffle, good though it is, must be varied to keep the waffle irons burning.

A cherry waffle, in honor of George Washington, therefore suggests to the wide-awake merchandiser the possibility of bringing forth seasonal dainties which should keep the waffle irons moving from his shelves and the meters moving also, turning out crisp delicacies at the tables of the masses.

Thus the waffle, whose grandsire was the lowly flapjack, becomes the pancake with a college education, a national institution and a never ending source of resales.

It has been complained by waffle fans that of all months, February, the shortest month of the year, is too short a time to devote to waffles. But this only means that each day's waffle effort must be the more intensive.

Which All Leads to the Conclusion—

Because it is waffles that people eat, and not the foundry out of which they are molded, cast or forged, it seems reasonable to suppose that the way to sell waffle irons is through the stomach. The way to a man's heart, many a wise woman knows, is to feed the brute. The way to sell him, then, should follow this well worn path from satisfied palate to generous pocketbook.

The most successful merchandisers of waffle irons in the past have followed that route. The inventor of the strawberry waffle, praise be his name, struck a responsive chord in every appetite.

Waffle iron selling methods are limited to a formula applicable to the selling of anything: advertise, display, personal salesmanship—a familiar story. These form the theme of the cash register symphony. The variations, in this case at least, are played upon the overtones of flavor, delicious tastes, novel culinary twists and tempting combinations.

The Father of his Country may yet be proud of his association with a truly American institution, waffles. If he is the first in the hearts of his countrymen the waffle may some day become the first in the stomachs of those same countrymen. Speed the day.

Developed Home Talent

WHEN the Mountain States Power Company, with headquarters at Albany, Ore., decided to put on its waffle iron sale last fall the question of advertising literature came up and with this question that of suitable artistic display material. John H. N. Adams, assistant sales manager, and in charge of advertising, hit upon the happy idea of illustrating the little envelope stuffer with the picture of one of the company's own girls.

IRONS *Burning*

Versatility Instead in February Sales

Thus Miss Mary Rowland, stenographer for the company, demonstrated by picture a tempting waffle iron idea for the cover of the direct-mail piece.

Waffle-Pancake Diversity

SINCE the more useful the appliance the better load builder it is, one make of waffle iron, which is convertible into a pancake griddle, offers many possibilities to the merchandiser who takes advantage of such features to sell one well priced appliance instead of two low priced but less diversified appliances.

With this "two-time" device the salesman has added talking features which should bowl over the veriest skeptic. If the waffle taste has not been developed the conversation can be veered to the humble flapjack. For others the appeal may be pitched on french toast, on fried cornmeal mush, on pancakes on one griddle and bacon simultaneously on its upper half or second griddle. There is even talk of thin toasted sandwiches and other delicatessen concoctions, depending upon the imagination and culinary creativeness of the purchaser, or better yet, the salesman.

After all, it appears that the best waffle-iron salesman is that person who has the keenest zest for appetizing tidbits. Waffle irons have even been used for warming plates, for table stoves and chaffing dish warmers, to heat croup kettles for sick babies and even for making ice cream.

No known case of use of a waffle iron as a warming pad has yet come to light, probably because of fear that the checker design might remain fixed to the anatomy. But for whatever use every new possibility gives it that much more saleability.

There seem to be few rules for the sale of waffle irons except these:

(1) Develop a real zest for waffles yourself so that in (2) advertising, (3) window display, (4) store display, (5) demonstration and (6) actually selling the appliance itself you will be whetting the purchaser's appetite with the delicious possibilities of enjoyment from its use.

A Tried and True Waffle Recipe
Clip it and keep it.
2 cups flour (measure after sifting once)
2 teaspoons baking powder
½ teaspoon salt
1 tablespoon sugar
2 eggs
1 two-third (1 2-3) cups sweet milk
2 tablespoons melted butter
Sift the dry ingredients together. Separate the eggs and to the yolks add one half of the milk. Beat well with the egg beater. Add this beaten mixture and then the remaining milk to the dry ingredients. Beat until the batter is smooth. Then add the melted butter and continue to beat the mixture until it is very light. Beat the egg whites until stiff, but not dry, and carefully fold them into the batter.
WAFFLES
Golden Brown and Piping Hot
Bake Them in a STAR-RITE Waffle Iron
February Special ..... $8.88 88c Down—the remainder $1.00 a month with your light bill.
We have a beautiful, new, bright nickel-plated STAR-Rite electric waffle iron here for you.
It bakes delicious golden brown waffles—just the kind of waffles that a true waffle fan likes best.
This waffle iron is available to you at a special low price—and the most unusual terms of payment.
The STAR-Rite electric waffle iron is of such quality that the Good Housekeeping Institute has given it the stamp of approval.
Equipped with attached tray and long connection cord, complete—while the supply lasts—$8.88.
A FREE TREAT
One Quart Can Frisbie's Syrup—Cane and Maple
With every Star-Rite Electric Waffle Iron we present the purchaser with a quart can of Frisbie's extra fancy syrup.
This is a delicious spread for waffles—and it's made right here in Spokane.
The Washington Water Power Co.
Corner Trent and Lincoln. Telephone Main 5121.
February is Waffle Month
Sale of waffle irons also promoted in all branch Electric shops

Price appeal is still used to good effect in appliance sales. This advertisement is based first on price, then on "mouth" appeal.

Oranges Sell Waffles in Southern California

Co-ordinating its efforts with the nation-wide February waffle special sale, the Southern California Edison Company sent out with its monthly light bills last year a four-page folder featuring five delightful recipes possible for waffle iron use. A special low price offer was made of $7.95 cash, or $2.95 down and $2 a month for three months. To insure full coverage of the territory the time limit on the sale was set for March 15. Fourteen additional recipes were promised anyone who would call at the nearest Edison office and request them. To obtain dealer tie-in the folder carried the line "Buy them at the nearest Edison Office or from your Electrical Dealer."

Try Orange Puff Waffles
and other recipes
... made by Busy Buttons on the Hold-Heet Waffle Iron. This waffle iron is offered you at a very low price as our "February Special." You may buy them at this price until March 15, 1927.
SEE INSIDE FOR PRICE AND RECIPES
Busy Buttons' February Special
ORANGE PUFF BATTER
SAUCE TO BE USED WITH ORANGE PUFF BATTER
FOR SUNDAY SUPPER SHORTCAKE
HOLD-HEET De Luxe Waffle-Iron
Offered you at the Special Price of
7.95 Cash
AFTER THE THEATRE
CORN FRITTERS
FOR UNEXPECTED GUESTS
FRENCH TOAST
GRAHAM WAFFLES
TERMS. $2.95 down and $2.00 per month for three months. This offer expires March 15th.
Buy them at the nearest Edison Office or from your Electrical Dealer

Rural Electric Cooking Classes in Utah

The Utah Power & Light Company concluded recently a series of weekly and bi-weekly electric cooking demonstrations in rural sections of its Salt Lake division territory. These classes were very well attended by the women, and were sponsored by various women's organizations in this territory. The eight lessons in the course were planned to treat the subject of electric cooking as comprehensively as possible in the short period available. All kinds of electric cooking equipment was used in various ways, and the lessons included the preparation of bread, cakes, pies, meats, salads, canned fruit, automatic oven dinners, luncheons, etc. Besides the regular class members, a number of women visitors were present at some of the classes.

The splendid co-operation of the organizations sponsoring the classes, and the favorable reaction of the class members to the service given them during the summer, were outstanding features.

At the last session prizes were offered by one of the organizations for the best song and the best essay written about the class. The resulting compositions were valuable as an indication of the mental attitude of the women of the community toward electric cooking, as a result of the demonstrations given.

News of the Industry

Boulder Dam Bill Has Been Signed by President

Authorizes $165,000,000 Appropriation for Dam and Canal and Provides for Power Plant Construction—Text Given in Full

Washington Correspondence

PRESIDENT COOLIDGE on Dec. 21 signed the Boulder Dam Bill, or as it is now officially designated, the Boulder Canyon Project Act. The bill authorizes an appropriation of $165,000,000 for the construction of a dam at Boulder or Black Canyon on the Colorado River between Nevada and Arizona, and the construction of the so-called All-American canal, with provision for a power plant to be constructed and operated either by the government or by private enterprise in the discretion of the Secretary of the Interior.

A digest of the act as it will appear on the statute books is as follows:

"The act authorizes the Secretary of the Interior to construct, operate and maintain (1) a dam at Boulder or Black Canyon sufficient to store not less than 20,000,000 acre-ft.; (2) a main canal to supply water to the Imperial and Coachella Valleys in California; (3) the secretary is authorized to construct, or cause to be constructed at or near the dam a power plant and incidental structures. (Sec. 1.)

"The Secretary of the Interior may, in his discretion, lease a unit or units of a government-built plant with right to generate electrical energy, or in the alternative, contracts may be made for the use of water for generation of electrical energy, the necessary plant and appurtenant structures to be built by the contractor. Provisions of the Federal Water Power Act, so far as applicable and in harmony with this act, shall govern.

"Water stored in the reservoir shall be used, first, for river regulation, improvement of navigation and flood control; second, for irrigation and domestic uses; and third, for power. Title to dam, reservoir, plant and incidental works shall forever remain in the United States. (Sec. 6.)

"Colorado River Dam fund established, from which all expenditures to be made, and into which all revenues must be covered. Financial features under jurisdiction of Secretary of Treasury. (Sec. 2.)

"Necessary appropriations from general treasury not to exceed $165,000,000 authorized to carry out work described. (Sec. 3.)

"Twenty-five million dollars allotted to flood control to be repaid from 62½ per cent of the revenues, if any, in excess of amount necessary to repay charges within amortization period of 50 years. If this sum not repaid in full within that period, 62½ per cent of all revenues shall be applied thereafter to payment of remainder. (Sec. 2b.)

"Act shall not become effective until Colorado River Compact approved. This compact shall control the storage, diversion and use of water. Compact shall be approved by the seven basin states, or if not so approved within six months, approval by six, one of which must be California, sufficient. (Sec. 4a.)

"Before any money is appropriated for construction of dam or power plant, contracts must be made, adequate, in the opinion of the Secretary of the Interior, to return cost of construction with interest at 4 per cent. No work shall be done on main canal until contracts are secured sufficient in the opinion of the secretary, to return all cost of construction, operation and maintenance in accordance with reclamation law. (Sec. 4b.)

"All irrigable public lands subject to entry under reclamation law and preference right of entry given to soldiers, sailors and marines, who also shall be given preference in employment, so far as practicable. (Sec. 9.)"

The matter of the division of the 7,500,000 acre-ft. of water annually apportioned to the lower basin states by the Colorado River Compact, which has long been a subject of controversy between California and Arizona, was settled through a compromise by which 4,400,000 acre-ft. were allotted to California, 2,800,000 to Arizona and 300,000 to Nevada.

At least a year must pass before construction can be begun. It is believed that that length of time will be required for ratification of the preliminary surveys and to handle the competitive bidding for the power. It is expected that $50,000 will be carried in the second deficiency bill to take care of preliminary studies and the preparation of plans which can go forward in the meantime.

The full text of the bill follows:

Be in enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

That for the purpose of controlling the floods, improving navigation and regulating the flow of the Colorado River, providing for storage and for the delivery of the stored waters thereof for reclamation of public lands and other beneficial uses exclusively within the United States, and for the generation of electrical energy as a means of making the project herein authorized a self-supporting and financially solvent undertaking, the Secretary of the Interior, subject to the terms of the Colorado River compact hereinafter mentioned, is hereby authorized to construct, operate, and maintain a dam and incidental works in the main stream of the Colorado River at Black Canyon or Boulder Canyon adequate to create a storage reservoir of a capacity of not less than 20,000,000 acre-feet of water and a main canal and appurtenant structures located entirely within the United States connecting the Laguna Dam, or other suitable diversion dam which the Secretary of the Interior is hereby authorized to construct if deemed necessary or advisable by him upon engineering or economic considerations, with the Imperial and Coachella valleys in California, the expenditures for said main canal and appurtenant structures to be reimbursable, as provided in the reclamation law, and shall not be paid out of revenues derived from the sale or disposal of water power or electric energy at the dam authorized to be constructed at said Black Canyon or Boulder Canyon or for water for potable purposes outside of the Imperial and Coachella valleys: Provided, however, that no charge shall be made for water or for the use, storage, or delivery of water for irrigation or water for potable purposes in the Imperial or Coachella valleys; also to construct and equip, operate, and maintain at or near said dam, or cause to be constructed a complete plant and incidental structures suitable for the fullest economic development of electrical energy from the water discharged from said reservoir, and to acquire by proceedings in eminent domain, or otherwise, all lands, rights of way, and other property necessary for said purposes.

Special Fund Created to Handle Expenditures

Sec. 2. (a) There is hereby established a special fund, to be known as the "Colorado River Dam fund" (hereinafter referred to as the "fund"), and to be available, as hereafter provided, only for carrying out the provisions of this Act. All revenues received in carrying out the provisions of this Act shall be paid into and expenditures shall be made out of the fund, under the direction of the Secretary of the Interior.

(b) The Secretary of the Treasury is authorized to advance to the fund from time to time and within the apppropria-

tions therefor, such amounts as the Secretary of the Interior deems necessary for carrying out the provisions of this Act, except that the aggregate amount of such advances shall not exceed the sum of $165,000,000. Of this amount the sum of $25,000,000 shall be allocated to flood control and shall be repaid to the United States out of 62½ per centum of reveiues, if any, in excess of the amount necessary to meet periodical payments during the period of amortization, as provided in section 4 of this Act. If said sum of $25,000,000 is not repaid in full during the period of amortization, then 62½ per centum of all net revenues shall be applied to payment of the remainder. Interest at the rate of 4 per centum per annum accruing during the year upon the amounts so advanced and remaining unpaid shall be paid annually out of the fund, except as herein otherwise provided.

Operation and Maintenance Excluded from Fund

(c) Moneys in the fund advanced under subdivision (b) shall be available only for expenditures for construction and the payment of interest, during construction, upon the amounts so advanced. No expenditures out of the fund shall be made for operation and maintenance except from appropriations therefor.

(d) The Secretary of the Treasury shall charge the fund as of June 30 in each year with such amount as may be necessary for the payment of interest on advances made under subdivision (b) at the rate of 4 per centum per annum accrued during the year upon the amounts so advanced and remaining unpaid, except that if the fund is insufficient to meet the payment of interest the Secretary of the Treasury may, in his discretion, defer any part of such payment, and the amount so deferred shall bear interest at the rate of 4 per centum per annum until paid.

(e) The Secretary of the Interior shall certify to the Secretary of the Treasury, at the close of each fiscal year, the amount of money in the fund in excess of the amount necessary for construction, operation, and maintenance, and payment of interest. Upon receipt of each such certificate the Secretary of the Treasury is authorized and directed to charge the fund with the amount so certified as repayment of the advances made under subdivision (b), which amount shall be covered into the Treasury to the credit of miscellaneous receipts.

Sec. 3. There is hereby authorized to be appropriated from time to time, out of any money in the treasury not otherwise appropriated, such sums of money as may be necessary to carry out the purposes of this Act, not exceeding in the aggregate $165,000,000.

Sec. 4 (a). This Act shall not take effect and no authority shall be exercised hereunder and no work shall be begun and no moneys expended on or in connection with the works or structures provided for in this Act, and no water rights shall be claimed or initiated hereunder, and no steps shall be taken by the United States or by others to initiate or perfect any claims to the use of water pertinent to such works or structures unless and until (1) the States of Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming shall have ratified the Colorado River compact, mentioned in section 12 hereof, and the president by public proclamation shall have so declared or (2) if said states fail to ratify the said compact within six months from the date of the passage of this Act, then, until six of said states, including the State of California, shall ratify said compact and shall consent to waive the provisions of the first paragraph of Article XI of said compact, which makes the same binding and obligatory only when approved by each of the seven states signatory thereto, and shall have approved said compact without conditions, save that of such six-state approval, and the president by public proclamation shall have so declared, and, further, until the State of California, by act of its legislature, shall agree irrevocably and unconditionally with the United States and for the benefit of the States of Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming, as an express covenant and in consideration of the passage of this Act, that the aggregate annual consumptive use (diversions less returns to the river) of water of and from the Colorado River for use in the State of California, including all uses under contracts made under the provisions of this Act and all water necessary for the supply of any rights which may now exist, shall not exceed four million four hundred thousand acre-feet of the waters apportioned to the lower basin states by paragraph (a) of Aritcle III of the Colorado River compact, plus not more than one-half of any excess or surplus waters unapportioned by said compact, such uses always to be subject to the terms of said compact.

Agreement Authorized for Division of Water

The States of Arizona, California, and Nevada are authorized to enter into an agreement which shall provide (1) that of the 7,500,000 acre-feet annually apportioned to the lower basin by paragraph (a) of Aritcle III of the Colorado River compact, there shall be apportioned to the State of Nevada 300,000 acre-feet and to the State of Arizona 2,800,000 acre-feet for exclusive beneficial consumptive use in perpetuity, and (2) that the State of Arizona may annually use one-half of the excess or surplus waters unapportioned by the Colorado River compact, and (3) that the State of Arizona shall have the exclusive beneficial consumptive use of the Gila River and its tributaries within the boundaries of said state, and (4) that the waters of the Gila River and its tributaries, except return flow after the same enters the Colorado River, shall never be subject to any diminution whatever by any allowance of water which may be made by treaty or otherwise to the United States of Mexico but if, as provided in paragraph (c) of Aritcle III of the Colorado River compact, it shall become necessary to supply water to the United States of Mexico from waters over and above the quantities which are surplus as defined by said compact then the State of California shall and will mutually agree with the State of Arizona to supply, out of the main stream of the Colorado River, one-half of any deficiency which must be supplied to Mexico by the lower basin, and (5) that the State of California shall and will further mutually agree with the States of Arizona and Nevada that none of said three states shall withhold water and none shall require the delivery of water, which cannot reasonably be applied to domestic and agricultural uses, and (6) that all of the provisions of said tri-state agreement shall be subject in all particulars to the provisions of the Colorado River compact, and (7) said agreement to take effect upon the ratification of the Colorado River compact by Arizona, California, and Nevada.

(b) Before any money is appropriated for the construction of said dam or power plant, or any construction work done or contracted for, the Secretary of the Interior shall make provision for revenues by contract, in accordance with the provisions of this Act, adequate in his judgment to insure payment of all expenses of operation and maintenance of said works incurred by the United States and the repayment, within 50 years from the date of the completion of said works, of all amounts advanced to the fund under Subdivision (b) of Section 2 for such work, together with interest thereon made reimbursable under this Act.

Before any money is appropriated for the construction of said main canal and appurtenant structures to connect the Laguna Dam with the Imperial and Coachella valleys in California, or any construction work is done upon said canal or contracted for, the Secretary of the Interior shall make provision for revenues, by contract or otherwise, adequate in his judgment to insure payment of all expenses of construction, operation, and maintenance of said main canal and appurtenant structures in the manner provided in the reclamation law.

Provision for Disposal of Excess Revenues

If during the period of amortization the Secretary of the Interior shall receive revenues in excess of the amount necessary to meet the periodical payments to the United States as provided in the contract, or contracts, executed under this Act, then, immediately after the settlement of such periodical payments, he shall pay to the State of Arizona 18¾ per centum of such excess revenues and to the State of Nevada 18¾ per centum of such excess revenues.

Sec. 5. That the Secretary of the Interior is hereby authorized, under such general regulations as he may prescribe, to contract for the storage of water in said reservoir and for the delivery thereof at such points on the river and on said canal as may be agreed upon, for irrigation and domestic uses, and generation of electrical energy and delivery at the switchboard to states, municipal corporations, political subdivisions, and private corporations of electrical energy generated at said dam, upon charges that will provide revenue which, in addition to other revenue accruing under the reclamation law and under this Act, will in his judgment cover all expenses of operation and maintenance incurred by the United States on account of works constructed under this Act and the payments to the United States under subdivision (b) of section 4. Contracts respecting water for irrigation and domestic uses shall be for permanent service and shall conform to paragraph (a) of section 4 of this Act. No person shall have or be entitled to have the use for any purpose of the water stored as aforesaid except by contract made as herein stated.

Provision for Disposition of Revenues Is Made

After the repayments to the United States of all money advanced with interest, charges shall be on such basis and the revenues derived therefrom shall be kept in a separate fund to be expended within the Colorado River Basin as may hereafter be prescribed by the Congress.

General and uniform regulations shall be prescribed by the said Secretary for the awarding of contracts for the sale and delivery of electrical energy, and for renewals under subdivision (b) of this section, and in making such contracts the following shall govern:

(a) No contract for electrical energy or for generation of electrical energy shall be of longer duration than 50 years from the date at which such energy is ready for delivery.

Contracts made pursuant to subdivision (a) of this section shall be made with a view to obtaining reasonable returns and shall contain provisions whereby at the end of 15 years from the date of their execution and every 10 years thereafter, there shall be readjustment of the contract, upon the demand of either party thereto, either upward or downward as to price, as the Secretary of the Interior may find to be justified by competitive conditions at distributing points or competitive centers, and with provisions under w disputes or disagreements as to interpretation or performance of such contract shall be determined either by arbitration or court proceedings, the Secretary of the Interior being authorized to act for the United States in such readjustments or proceedings.

(b) The holder of any contract for electrical energy not in default thereunder shall be entitled to a renewal thereof upon such terms and conditions as may be authorized or required under the then existing laws and regulations, unless the property of such holder dependent for its usefulness on a continuation of the contract be purchased or acquired and such holder be compensated for damages to its property, used and useful in the transmission and distribution of such electrical energy and not taken, resulting from the termination of the supply.

Contracts for Power and Water Regulated

(c) Contracts for the use of water and necessary privileges for the generation and distribution of hydroelectric energy or for the sale and delivery of electrical energy shall be made with responsible applicants therefor who will pay the price fixed by the said Secretary with a view to meeting the revenue requirements herein provided for. In case of conflicting applications, if any, such conflicts shall be resolved by the said Secretary, after hearing, with due regard to the public interest, and in conformity with the policy expressed in the Federal Water Power Act as to conflicting applications for permits and licenses, except that preference to applicants for the use of water and appurtenant works and privileges necessary for the generation and distribution of hydroelectric energy, or for delivery at the switchboard of a hydroelectric plant, shall be given, first, to a state for the generation or purchase of electric energy for use in the state, and the States of Arizona, California, and Nevada shall be given equal opportunity as such applicants.

The rights covered by such preference shall be contracted for by such state within six months after notice by the Secretary of the Interior and to be paid for on the same terms and conditions as may be provided in other similar contracts made by said Secretary: Provided, however, That no application of a state or a political subdivision for an allocation of water for power purposes or of electrical energy shall be denied or another application in conflict therewith be granted on the ground that the bond issue of such state or political subdivision, necessary to enable the applicant to utilize such water and appurtenant works and privileges necessary for the generation and distribution of hydroelectric energy or the electrical energy applied for, has not been authorized or marketed, until after a reasonable time, to be determined by the said Secretary, has been given to such applicant to have given to such applicant to have such bond issue authorized and marketed.

(d) Any agency receiving a contract for electrical energy equivalent to 100,000 firm horsepower, or more, may, when deemed feasible by the said Secretary, from engineering and economic considerations and under general regulations prescribed by him, be required to permit any other agency having contracts hereunder for less than the equivalent of 25,000, firm horsepower, upon application to the Secretary of the Interior made within 60 days from the execution of the contract of the agency the use of whose transmission line is applied for, to participate in the benefits and use of any main transmission line constructed or to be constructed by the former for carrying such energy (not exceeding, however, one-fourth the capacity of such line,) upon payment by such other agencies of a reasonable share of the cost of construction, operation, and maintenance thereof.

Reservoir to Be Used for Three Purposes

The use is hereby authorized of such public and reserved lands of the United States as may be necessary or convenient for the construction, operation, and maintenance of main transmission lines to transmit said electrical energy.

Sec. 6. That the dam and reservoir provided for by section 1 hereof shall be used: First, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses and satisfaction of present perfected rights in pursuance of Article VIII of said Colorado River compact; and, third, for power. The title to said dam, reservoir, plant, and incidental works shall forever remain in the United States, and the United States shall, until otherwise provided by Congress, control, manage, and operate the same, except as herein otherwise provided; provided, however, that the Secretary of the Interior may, in his discretion, enter into contracts of lease of a unit or units of any government-built plant, with right to generate electrical energy, or, alternatively, to enter into contracts of lease for the use of water for the generation of electrical energy as herein provided, in either of which events the provisions of section 5 of this Act, relating to revenue, term, renewals, determination of conflicting applications, and joint use of transmission lines under contracts for the sale of electrical energy, shall apply.

The Secretary of the Interior shall prescribe and enforce rules and regulations conforming with the requirements of the Federal Water Power Act, so far as applicable, respecting maintenance of works in condition of repair adequate for their efficient operation, maintenance of a system of accounting, control of rates and service in the absence of state regulation or interstate agreement, valuation for rate-making purposes, transfers of contracts, contracts extending beyond the lease period, expropriation of excessive profits, recapture and/or emergency use by the United States of property of lessees, and penalties for enforcing regulations made under this Act or penalizing failure to comply with such regulations or with the provisions of this Act. He shall also conform with other provisions of the Federal Water Power Act and of the rules and regulations of the Federal Power Commission, which have been devised or which may be hereafter devised, for the protection of the investor and consumer.

The Federal Power Commission is hereby directed not to issue or approve any permits or licenses under said Federal Water Power Act upon or affecting the Colorado River or any of its tributries, except the Gila River, in the States of Colorado, Wyoming, Utah, New Mexico, Nevada, Arizona and California until this Act shall become effective as provided in section 4 herein.

Transfer of Properties From United States

Sec. 7. That the Secretary of the Interior may, in his discretion, when repayments to the United States of all money advanced, with interest, reimbursable hereunder, shall have been made, transfer the title to said canal and appurtenant structures, except the Laguna Dam and the main canal and appurtenant structures down to and including Syphon Drop, to the districts or other agencies of the United States having a beneficial interest therein in proportion to their respective capital investments under such form or organization as may be acceptable to him. The said districts or other agencies shall have the privilege at any time of utilizing by contract or otherwise such power possibilities as may exist upon said canal, in proportion to their respective contributions or obligations toward the capital cost of said canal and appurtenant structures from and including the diversion works to the point where each respective power plant may be located. The net proceeds from any power development on said canal shall be paid into the fund and credited to said districts or other agencies on their said contracts, in proportion to their rights to develop power, until the districts or other agencies using said canal shall have paid thereby and under any contract or otherwise an amount of money equivalent to the operation and maintenance expense and cost of construction thereof.

Sec. 8. (a) The United States, its permittees, licensees, and contractees, and all users and appropriators of water stored, diverted, carried, and/or distributed by the reservoir, canals, and other works herein authorized shall observe and be subject to and controlled by said Colorado River compact in the construction, management, and operation of said reservoir, canals, and other works and the storage, diversion, delivery, and use of water for the generation of power, irrigation, and other purposes, anything in this Act to the con-

trary notwithstanding, and all permits, licenses, and contracts shall so provide.

Compact Between States to Control Administration

(b) Also the United States, in constructing, managing, and operating the dam, reservoir, canals, and other works herein authorized, including the appropriation, delivery, and use of water for the generation of power, irrigation, or other uses, and all users of water thus delivered and all users and appropriators of waters stored by said reservoir and/or carried by said canal, including all permittees and licensees of the United States or any of its agencies, shall observe and be subject to and controlled, anything to the contrary herein notwithstanding, by the terms of such compact, if any, between the State of Arizona, California, and Nevada, or any two thereof, for the equitable division of the benefits, including power, arising from the use of water accruing to said states, subsidiary to and consistent with said Colorado River compact, which may be negotiated and approved by said states and to which Congress shall give its consent and approval on or before January 1, 1929; and the terms of any such compact concluded between said states and approved and consented to by Congress after said date: Provided, that in the latter case such compact shall be subject to all contracts, if any, made by the Secretary of the Interior under section 5 hereof prior to the date of such approval and consent by Congress.

Sec. 9. That all lands of the United States found by the Secretary of the Interior to be practicable of irrigation and reclamation by the irrigation works authorized herein shall be withdrawn from public entry. Thereafter, at the direction of the Secretary of the Interior, such lands shall be opened for entry, in tracts varying in size but not exceeding 160 acres, as may be determined by the Secretary of the Interior, in accordance with the provisions of the reclamation law, and any such entryman shall pay an equitable share in accordance with the benefits received, as determined by the said Secretary, of the construction cost of said canal and appurtenant structures; said payments to be made in such installments and at such times as may be specified by the Secretary of the Interior, in accordance with the provisions of the said reclamation law, and shall constitute revenue from said project and be covered into the fund herein provided for: Provided, that all persons who have served in the United States Army, Navy, or Marine Corps during the war with Germany, the war with Spain, or in the suppression of the insurrection in the Philippines, and who have been honorably separated or discharged therefrom or placed in the Regular Army or Navy Reserve, shall have the exclusive preference right for a period of three months to enter said lands, subject, however, to the provisions of subsection (c) of section 4, Act of December 5, 1924 (Forty-third Statutes at Large, page 702); and also, so far as practicable, preference shall be given to said persons in all construction work authorized by this Act: Provided further, that in the event such an entry shall be relinquished at any time prior to actual residence upon the land by the entryman for not less than one year, lands so relinquished shall not be subject to entry for a period of 60 days after the filing and notation of the relinquishment in the local land office, and after the expiration of said 60-day period such lands shall be open to entry, subject to the preference in this section provided.

Extension of Agreement With Imperial Valley District

Sec. 10. That nothing in this Act shall be construed as modifying in any manner the existing contract, dated October 23, 1918, between the United States and the Imperial Irrigation District, providing for a connection with Laguna Dam; but the Secretary of the Interior is authorized to enter into contract or contracts with the said district or other districts, persons, or agencies for the construction, in accordance with this Act, of said canal and appurtenant structures, and also for the operation and maintenance thereof, with the consent of the other users.

Sec. 11. That the Secretary of the Interior is hereby authorized to make such studies, surveys, investigations, and do such engineering as may be necessary to determine the lands in the State of Arizona that should be embraced within the boundaries of a reclamation project, heretofore commonly known and hereafter to be known as the Parker-Gila Valley reclamation project, and to recommend the most practicable and feasible method of irrigating lands within said project, or units thereof, and the cost of the same; and the appropriation of such sums of money as may be necessary for the aforesaid purposes from time to time is hereby authorized. The Secretary shall report to Congress as soon as practicable, and not later than December 10, 1931, his findings, conclusions and recommendations regarding such project.

Sec. 12. "Political subdivision" or "political subdivisions" as used in this Act shall be understood to include any state, irrigation or other district, municipality, or other governmental organization.

"Reclamation law" as used in this Act shall be understood to mean that certain Act of the Congress of the United States approved June 17, 1902, entitled "An Act appropriating the receipts from the sale and disposal of public land in certain states and territories to the construction of irrigation works for the reclamation of arid lands," and the Acts amendatory thereof and supplemental thereto.

"Maintenance" as used herein shall be deemed to include in each instance provision for keeping the works in good operating condition.

"The Federal Water Power Act," as used in this Act, shall be understood to mean that certain Act of Congress of the United States approved June 10, 1920, entitled "An Act to create a Federal Power Commission; to provide for the improvement of navigation; the development of water power; the use of the public lands in relation thereto; and to repeal section 18 of the River and Harbor Appropriation Act, approved August 8, 1917, and for other purposes," and the Acts amendatory thereof and supplemental thereto.

"Domestic" whenever employed in this Act shall include water uses defined as "domestic" in said Colorado River compact.

Colorado River Compact Controls Water Rights

Sec. 13. (a) The Colorado River compact signed at Santa Fe, N. M., November 24, 1922, pursuant to Act of Congress approved August 19, 1921, entitled "An Act to permit a compact or agreement between the States of Arizona, California, Colorado, Nevada, New Mexico, Utah, and Wyoming respecting the disposition and apportionment of the waters of the Colorado River, and for other purposes," is hereby approved by the Congress of the United States, and the provisions of the first paragraph of Article 11 of the said Colorado River compact, making said compact binding and obligatory when it shall have been approved by the legislature of each of the signatory states, are hereby waived, and this approval shall become effective when the State of California and at least five of the other states mentioned, shall have approved or may hereafter approve said compact as aforesaid and shall consent to such waiver, as herein provided.

(b) The rights of the United States in or to waters of the Colorado River and its tributaries howsoever claimed or acquired, as well as the rights of those claiming under the United States, shall be subject to and controlled by said Colorado River compact.

(c) Also all patents, grants, contracts, concessions, leases, permits, licenses, rights-of-way, or other privileges from the United States or under its authority, necessary or convenient for the use of waters of the Colorado River or its tributaries, or for the generation or transmission of electrical energy generated by means of the waters of said river or its tributaries, whether under this Act, the Federal Water Power Act, or otherwise, shall be upon the express conditions and with the express covenant that the rights of the recipients or holders thereof to waters of the river or its tributaries, for the use of which the same are necessary, convenient, or incidental, and the use of the same shall likewise be subject to and controlled by said Colorado River compact.

Investigation Authorized By Secretary of the Interior

(d) The conditions and covenants referred to herein shall be deemed to run with the land and the right, interest, or privilege therein and water right, and shall attach as a matter of law, whether set out or referred to in the instrument evidencing any such patent, grant, contract, concession, lease, permit, license, right-of-way, or other privilege from the United States or under its authority, or not, and shall be deemed to be for the benefit of and be available to the States of Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming, and the users of water therein or thereunder, by way of suit, defense, or otherwise, in any litigation respecting the waters of the Colorado River or its tributaries.

Sec. 14. This Act shall be deemed a supplement to the reclamation law which said reclamation law shall govern the construction, operation, and management of the works herein authorized, except as otherwise herein provided.

Sec. 15. The Secretary of the Interior is authorized and directed to make investigation and public reports of the feasibility of projects for irrigation,

generation of electric power, and other purposes in the States of Arizona, Nevada, Colorado, New Mexico, Utah, and Wyoming for the purpose of making such information available to said states and to the Congress, and of formulating a comprehensive scheme of control and the improvement and utilization of the water of the Colorado River and its tributaries. The sum of $250,000 is hereby authorized to be appropriated from said Colorado River Dam fund, created by section 2 of this Act, for such purposes.

Sec. 16. In furtherance of any comprehensive plan formulated hereafter for the control, improvement, and utilization of the resources of the Colorado River system and to the end that the project authorized by this Act may constitute and be administered as a unit in such control, improvement, and utilization, any commission or commissioner duly authorized under the laws of any ratifying state in that behalf shall have the right to act in an advisory capacity to and in co-operation with the Secretary of the Interior in the exercise of any authority under the provisions of sections 4, 5, and 14 of this Act, and shall have at all times access to records of all Federal agencies empowered to act under said sections, and shall be entitled to have copies of said records on request.

Sec. 17. Claims of the United States arising out of any contract authorized by this Act shall have priority over all others, secured or unsecured.

Sec. 18. Nothing herein shall be construed as interfering with such rights as the states now have either to the waters within their borders or to adopt such policies and enact such laws as they may deem necessary with respect to the appropriation, control, and use of waters within their borders, except as modified by the Colorado River compact or other interstate agreement.

Supplemental Contracts By States Permitted

Sec. 19. That the consent of Congress is hereby given to the States of Arizona, California, Colorado, Nevada, New Mexico, Utah and Wyoming to negotiate and enter into compacts or agreements, supplemental to and in conformity with the Colorado River compact and consistent with this Act for a comprehensive plan for the development of the Colorado River and providing for the storage, diversion and use of the waters of said river. Any such compact or agreement may provide fo rthe construction of dams, headworks, and other diversion works or structures for flood control, reclamation, improvement of navigation, division of water, or other purposes and/or the construction of power houses or other structures for the purpose of the development of water power and the financing of the same; and for such purposes may authorize the creation of interstate commissions and/or the creation of corporations, authorities, or other instrumentalities.

(a) Such consent is given upon condition that a representative of the United States, to be appointed by the President, shall participate in the negotiations and shall make report to Congress of the proceedings and of any compact or agreement entered into.

(b) No such compact or agreement shall be binding or obligatory upon any of such states unless and until it has been approved by the legislature of each of such states and by the Congress of the United States.

Sec. 20. Nothing in this Act shall be construed as a denial or recognition of any rights, if any, in Mexico to the use of the waters of the Colorado River system.

Sec. 21. That the short title of this Act shall be "Boulder Canyon Project Act."

Public Ownership Bill Proposed in Washington

Act to Conserve State Water and Power Resources Would Open Way for Many Publicly Owned Hydro-Electric Projects

SPONSORED by the state grange and public ownership advocates, a petition is being circulated in the State of Washington to bring before the 1929 legislature a bill opening the way for the establishment of publicly owned water-power projects on a large scale. The petition requires 50,000 signatures of registered voters in order to secure submission of the bill to the legislature for its action, and current opinion in the state is to the effect that these signatures will be obtained. The legislature, on being thus duly petitioned, may then pass the bill with or without referring it back to the people for approval.

The stated purpose of the proposed act is to conserve the water and power resources of the state for the benefit of the people, and to supply public utility service, including water and electricity, for all uses. To accomplish this purpose it authorizes the creation of municipal corporations, called public utility districts, comprising an entire county or any portion thereof, and permits the consolidation of two or more contiguous districts into one district. A district may be formed by vote within the proposed district at any general election, and the proposition of forming such district may be made by the county commissioners either on their own motion or pursuant to a petition of 10 per cent of the voters of the proposed district.

The act gives broad powers to public utility districts with respect to irrigation, domestic water supply and hydro-electric power. These powers include the right to construct and operate water works, irrigation systems and power plants, either steam or hydro-electric; to purchase or condemn lands within or without the limits of the district; to sell water or electrical energy within or without its limits and make its own regulations with respect thereto, free from any control by the department of public works; to issue general obligation or utility bonds; to levy an annual tax not exceeding 2 mills in any year, exclusive of interest and redemption of general obligation bonds; and to exercise other lesser functions, and "do all things necessary to carry out the provisions of this act."

Provision is made that the powers of the district shall be exercised by a commission of three voting freeholders of the district, elected for three-year terms, who shall appoint a manager for the district and who may employ engineering and legal and other professional assistance.

McGraw Medal to Be Awarded to Pacific Coast Man

THE McGraw Medal for Co-operation for 1928 will be presented to a Pacific Coast man for the first time since the establishment of four awards for electrical men by James H. McGraw in 1925. The formal presentation will be made at a luncheon meeting sponsored by the San Francisco Electrical Development League for the California Electrical Bureau, which is acting for the Society for Electrical Development in presenting the medal. The meeting will bring together representatives of every branch of the electrical industry at the Palace Hotel in San Francisco on Jan. 14, 1929. The identity of the recipient of the award will not be announced until the meeting.

Power Project Plans Call for 60,000-Hp. Unit

Construction of a hydro-electric development in Douglas and Chelan Counties is contemplated in an application filed with the state supervisor of hydraulics by W. H. McGrath for the Washington Electric Company, a subsidiary of the Puget Sound Power & Light Company.

The company seeks an appropriation of 24,000 sec.-ft. from the flow of the Columbia River for the development of 60,000 hp. in the first unit, to be used for manufacturing, electric operation of railroads, city lighting and general utility purposes. Plans include construction of a dam 25 ft. high and 1,500 ft. long to impound 2,500 acre-ft. of water, at an estimated cost of $2,500,000. Construction may be commenced in 1929.

The power site is that known as the Rock Island site located about fourteen miles down the river from Wenatchee.

Pacific Gas and Electric Company Sets 1929 New Business Quota of $5,257,300

NEW business added to the system of the Pacific Gas and Electric Company during 1928 will approximate $4,800,000 in annual revenue, and a quota of $5,257,300 has been established for 1929 with a sales budget of almost a million dollars.

These facts were brought out at a banquet meeting of the entire commercial department and executives of the company held in San Francisco Dec. 21.

R. E. Fisher, vice-president in charge of public relations and sales, presided over the gathering.

In reviewing the accomplishments of the commercial department in 1928 it was pointed out that only $800,000 of the original budget of $982,000 was spent in securing new business. The sales organization has increased from 241 on Jan. 1, 1928, to 400 at the present time. During the year 28 sales schools with 394 salesmen in attendance were held through the co-operation of manufacturers and jobbers. Eighty-two employee meetings brought together 4,200 employees in an endeavor to enlist employee co-operation in the sales program.

Of the new business secured during the year, 79 per cent of the electric load and 96 per cent of the gas business required no additional investment in facilities.

During the year over 700,000 consumer contacts were made for the purpose of explaining rate reductions. Other consumer contacts included 68 luncheon meetings and 29 cooking schools.

Approximately $129,000 was spent in advertising. To secure dealer co-operation 738 meetings with dealers were held with 13,300 people in attendance.

Kilowatt-hour sales during the year increased by 132,000,000 kw.-hr., resulting in an addition of $1,800,000 in gross earnings. There would have been an additional increase of $990,000 in gross had it not been for the decrease in rates early in the year.

P. M. Downing, vice-president in charge of operation, assured the commercial department that there would be ample energy for sale during 1929 when he said: "We shall have in excess of 1,500,000,000 kw.-hr. in 1929. We are prepared for any demand created by this sales program."

The salient points of the 1929 program brought out by H. M. Crawford, general manager of sales, were as follows:

Gas and electric appliances to be sold by the commercial department during the year will have a value of $2,250,000 and will include 40 carloads of electric ranges, 17 carloads of lighting fixtures, and 19 carloads of small air heaters.

On advertising in 165 newspapers $125,000 will be spent, in addition to 600,000 bill inserts, 98,000 employee broadsides and 1,400,000 consumer broadsides. An employee bonus fund of $10,000 has been set up to secure the co-operation of the rank and file in putting over the sales program. Commissions to be paid salesmen will amount to $440,000.

Following the presentation of the sales plan, Mr. Fisher called upon the executives of the company for their approval. F. A. Leach, Jr., vice-president and general manager, congratulated the sales force on its 1928 accomplishments and gave assurance of full executive support of the 1929 program.

A. F. Hockenbeamer, president of the company, in voicing his approval pointed out that on Nov. 30, 1928, the company was serving 1,002,000 customers. He said: "With a commercial department consisting of a well organized, well trained, energetic sales force, having the backing of 10,000 employees and every executive officer, the 1929 program cannot help but succeed. You salesmen must remember that you are ambassadors of good-will. I cannot help but emphasize the fact that the sales force is today the most important part of our corporate structure. Last year you secured more than $4 in gross revenue for every dollar spent for sales expense. I wish you every success in your endeavor to secure $5.50 in return for every dollar spent in 1929. You may rest assured that you will have the active support of every executive and every employee of the company."

One of the features of the meeting was the distribution of prizes to the sales organization that had been won in various campaigns during the year. The R. E. Fisher Trophy awarded to the division accomplishing the highest per cent of quota in the fall load-building campaign went to J. F. Pollard of the Coast Valleys Division with 215 per cent of quota. The H. M. Crawford Trophy for the division sales manager reaching 100 per cent of quota first in the same campaign went to P. S. George of the Coast Valleys Division. The Baseball Trophy for the winner of the summer range and water heater campaign went to the Colgate Division, E. C. Johnson, sales manager.

Will Not Sell Systems or Power to Municipality

Taking the position that there is no law forcing a utility to sell electrical energy to be used in competition with itself, the Pacific Gas and Electric Company and the Great Western Power Company of California, which both serve the town of Fairfield, Solano County, have announced that they have adopted that policy as a matter of joint agreement and will refuse to sell electrical energy to Fairfield in the event that that town should acquire its own distribution system.

This declaration of policy was brought about through the fact that the citizens of Fairfield have expressed a desire that the city acquire an electrical distribution system. One tentative plan proposes the acquisition of one or both of the existing privately owned distribution systems, by purchase if possible, or condemnation, and the purchase of energy by the city at wholesale rates from one or both power companies.

Another plan calls for the erection of an independent distribution system. Both power companies have announced that their systems are not for sale and that if the City of Fairfield should build its own system they would refuse to sell the necessary power.

E. A. Rolison is the proposed consulting engineer for the project.

All Dressed Up for Christmas

THE lobby of the general office building of The Washington Water Power Company in Spokane presented a most attractive appearance after it had been garbed in holiday attire. This view shows the west end of the lobby; in the east end was a display of electrical appliances.

Signs Mark Cars Equipped With First-Aid Kits

This sign on a car or truck of the San Joaquin Light & Power Corporation, Fresno, means that the vehicle

carries a standard first aid kit and one or more men who know how to use it. These signs are issued only to men who have taken first aid instruction and who are capable of administering first aid until a physician takes charge of the case.

First aid kits are installed on all line trucks, substation construction trucks and cars used by substation inspectors and other employees whose work takes them outdoors all or part of the time. The sign is issued to one man on the truck or car who is responsible for the use of the first aid kit and its maintenance, and whenever he changes cars he takes this sign and kit along with him.

State Supervision of Dams Debated at San Francisco

For the purpose of discussing proposed legislation covering state regulation and supervision of dams, a hearing was held in San Francisco Dec. 7-8, at the call of the director of the California Department of Public Works and the State Railroad Commission. Those in attendance included the state engineer, consulting engineers, engineers of the Railroad Commission, representatives of numerous power companies and members of the committee representing the four California sections of the American Society of Civil Engineers which has been preparing a bill to be submitted to the next state legislature.

After very full discussion on both days, various proposals were put to a vote and some of those approved were: that some new legislation is necessary relative to state regulation and supervision of dams; that authority for the needed control should be vested in a single officer of the state; excepting only dams built by the federal government, all dams within the state should be subject to state control, provided the height exceeds 10 ft. or the storage exceeds 10 acre-ft. or the drainage basin exceeds one square mile in area. It was also agreed that dams now in service should be inspected and checked up by the same state authority that has control over construction of new dams.

The bill as prepared by the committee representing sections of the American Society of Civil Engineers, which was presented and filed for further consideration, suggested a complete program for state control with penalties for violation. Under this proposed bill authority for granting permits would be vested in the office of the director of public works, and responsibility for checking, inspection and supervision in the office of the state engineer, who would call in as aids, when conditions made it desirable, a board of consulting engineers to be paid by the applicant.

Three Former El Paso Co. Managers Promoted

Announcement of personnel changes in the organization of Stone & Webster, Inc., Boston, carries word of the promotion of several men well known to the electrical industry in the West.

The first of these is J. F. McLaughlin, ranking vice-president of the Virginia Electric & Power Company, Richmond, who has been made district

J. F. McLAUGHLIN

manager of the companies under the executive management of Stone & Webster in the southwestern district comprising the properties situated in Texas, Louisiana, New Mexico and Mexico. For three years from 1922 to 1925, Mr. McLaughlin was general superintendent of lighting and power for the El Paso Electric Company, El Paso, Texas, and then was appointed manager of the Baton Rouge Electric Company.

TOM P. WALKER

Mr. McLaughlin is succeeded by Tom P. Walker, vice-president, Virginia Electric & Power Company, with headquarters in Norfolk, whence he has been transferred to Richmond. Mr. Walker served as manager of the El Paso Electric Company from 1925 to 1927. He is a graduate of the University of Nevada and entered the employ of Stone & Webster at Reno.

Succeeding Mr. Walker, Joseph Bowes, who has been manager of the El Paso Electric Company since the middle of 1927, has been transferred to the Virginia Electric & Power Company, where he assumed charge of the Norfolk division of that company on Dec. 1, 1928.

JOSEPH BOWES

Mr. Bowes' successor, the new manager at El Paso, is Francis J. Gannon, formerly assistant treasurer and secretary of Davis Islands, Inc., Davis Islands, Tampa, Fla., and prior to that assistant treasurer for varying periods of time for several of the companies under executive management of Stone & Webster. The position of manager of the El Paso Electric Company carries with it also the duties of manager of the El Paso and Juarez Traction Company, Rio Grande Valley Traction Company, and the Mesilla Valley Electric Company. Mr. Gannon has been in the

FRANCIS J. GANNON

public utility field for the past twenty-six years. During part of that time, from 1911 to 1916, he served as assistant treasurer of the Reno Power, Light & Water Company and the Truckee River Power Company, now the Sierra Pacific Power Company.

Northwestern Co. to Add to Steam Plant Capacity

Plans for increasing system capacity by about 50 per cent by the addition of a new steam unit at its Lincoln St. plant in Portland at a cost of $1,200,000 have been announced by the Northwestern Electric Company. The principal features of the addition are a 27,800-kw. steam turbo-generator unit and a 2,550-hp. boiler to operate at 250 lb. pressure. The installation of this equipment will necessitate two additions to the present plant building. These additions will be of structural steel and concrete.

A further improvement planned is the erection of a new reinforced concrete building adjacent to the present plant to house the switching and bus structure of the enlarged plant. The equipment of this character now installed in the present plant building will be redesigned and moved into the new building on completion of the projected plant enlargement. Distribution voltage from this point is at generation voltage, 11 kv., and no increase in transformer capacity to step this voltage up to 66 kv. for the tie line be-'ween the Lincoln St. plant and the Albina substation, is now being considered. Completion of the entire improvement is scheduled for Sept. 1, 1929.

More remote plans for further increase in the generating capacity of the company include a possible development of a hydro-electric plant on the North Fork of the Lewis River, though at the present time no announcement of a definite design for such a development is made. Foundation borings are being taken at the Ariel dam site on the river about 27 miles north of Portland, and about twelve miles below the Yale site, which at one time was examined as the site of a possible development by the company. Development at the Ariel site would be larger than that once projected for the Yale site.

New Edison Co. Divisions Cause Personnel Changes

Two geographical divisions, each one of which will comprise a number of districts, will be established by the Southern California Edison Company on the first of the year. The first one of these, to be known as the Eastern Division, will be made up of Pomona, Redlands, San Bernardino, Ontario, Monrovia and Covina. C. E. Houston, district manager of Pomona, will be the division manager over this entire territory. For the present he also will retain his position of district manager for the Pomona district.

Santa Barbara, Ventura, Santa Paula, Oxnard and Ojai are to be known as the Northern Division, with R. R. Walbridge as division manager. Mr. Walbridge also will continue, for the present, to occupy the position of district manager in Santa Barbara.

Other changes which are scheduled to take place Jan. 1, 1929, in the commercial organization of the Edison company follow:

Myron McNeal, district manager, Montebello district, will become district manager of both Montebello and Vernon districts, assuming the title of district manager, Vernon-Montebello districts. H. A. Brody, district manager, Oxnard district, is to become assistant district manager of the Montebello district. C. M. Campbell, chief clerk in Pasadena, is to be promoted to district manager at Oxnard.

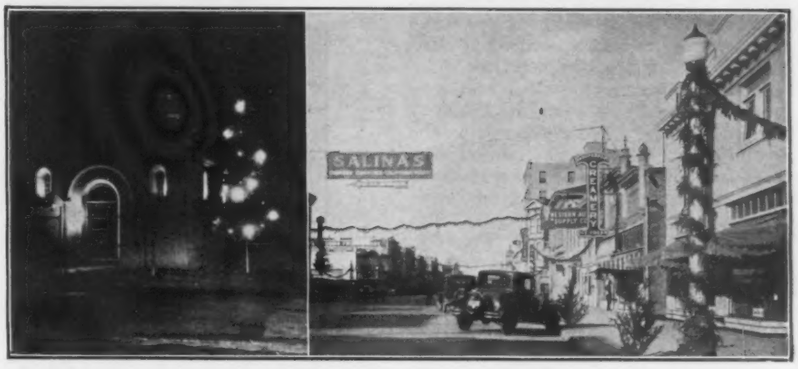
R. E. Bacon, district manager of Tulare, is to be transferred to the Santa Ana district as assistant district manager under W. L. Deimling, district manager. John White, district manager of Hanford, will be transferred to Tulare as district manager. W. J. Keil, power specialist in the Oxnard district, will become district manager at Hanford.

H. S. Williamson, district manager, retires from actual duty on Jan. 1. His position in Redlands will be filled by the transfer of Paul V. Moffat, present district manager of Delano. F. C. Schureman, present chief clerk in Alhambra district, is to be promoted to district manager at Delano.

J. H. Mead, special agent of the commercial department at the general office, will become assistant district manager in the Pomona district. C. B. Eaton, chief clerk in Santa Monica district, is to be transferred to the general office as chief clerk in the commercial department.

Outdoor Lighting Appeal Brings Wholehearted Response

THAT the idea of the outdoor Christmas tree and illuminated decorations for the holiday season stirred the imagination of the members of the electrical industry is shown by the wholehearted way in which they responded to the appeal throughout the length and breadth of California. Communities, big and little, have put on the holiday garb of gaily festooned trees and twinkling colored lights. In every instance every branch of the electrical industry has co-operated with city officials, other business houses and citizens to secure a decorative effect.



The pictures shown are typical examples of this co-operation. At the left is a view of one of the substations of the Pacific Gas and Electric Company on the highway between King City and Salinas. Under the direction of J. F. Pollard, manager of the Coast Valleys division of this company, a lighted Christmas tree was placed near every one of its substations throughout its territory. At the right this glimpse of the main street of Salinas, which is served by the Coast Valleys division, shows how that community entered into the holiday spirit. With Christmas greens, stringers of multi-colored lights, a large sign bearing the name of the town in colored lights, colored bulbs in the electroliers, and small Christmas trees, Salinas presented a most festive appearance.

The San Joaquin Light & Power Corporation also lighted a Christmas tree at each of its substations, and they made a brave showing, flashing their lights from Merced to Santa Maria through all the San Joaquin Power Company's districts. In anticipation of the 1929 holiday season evergreen trees, which next year will become live Christmas trees, now are being planted by the San Joaquin company in its substation yards.

Tacoma to Call for Bids on 30,000-Hp. Power Plant

The City of Tacoma, Wash., will increase the output of its Cushman hydro-electric power project by approximately 30,000 hp., and bids on the contracts involved in the building of the dam, driving and lining of the 2½-mile tunnel and construction of a power house at Potlatch, are to be called for within the next few weeks, according to J. L. Stannard, construction engineer.

The dam will be 70 ft. wide at the bottom, about 540 ft. wide at the top and 240 ft. high. The work will cost approximately $2,000,000.

San Joaquin Co. Organizes Agricultural Bureau

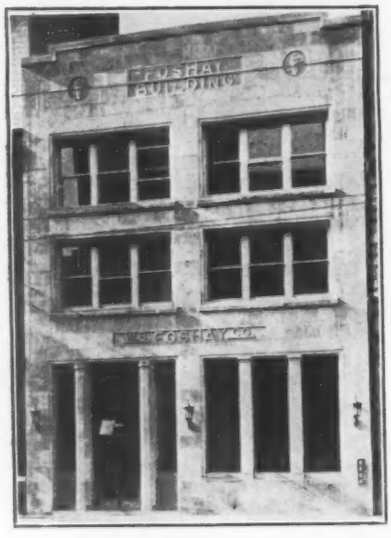
Co-operating with San Joaquin Valley farm leaders in developing a program of farm diversification, the San Joaquin Light & Power Corporation, Fresno, Calif., has organized a new agricultural bureau to study methods of diversification and the application of electric power to the diversified farm. The new bureau is a division of the sales department and is being operated by E. G. Stahl, former manager of the San Joaquin district of the company.

Experiments of successful and progressive farms are being watched by the bureau, and publicity given to the results through community newspapers, farm center talks, and personal contacts with the farmers. Especial attention is being given to dairying, hog raising, poultry raising, and cotton growing, side lines which are proving profitable additions to the orchards and vineyards of the valley. In economy of both time and money electrical equipment is being found a great aid to the farmer who carries on several activities at once, and figures on costs and results are made available through the power company bureau.

Foshay Coast Headquarters in New Building

Formal opening of the Foshay Building, the new Pacific Coast headquarters of the W. B. Foshay Company at 243 Kearny St., San Francisco, took place Dec. 12.

Wilbur B. Foshay, president of the company, with headquarters in Minneapolis, came to the Coast to be present at the ceremonies. The Public Utilities California Corporation of the Foshay company manages a number of public utilities in California, including the Central Mendocino County Power Company. The Foshay company personnel on the Pacific Coast approximates 350.



The Foshay Building, 243 Kearny St., San Francisco.

The building was thrown open to the public throughout the day, and in the evening a banquet was held at the Palace Hotel in Mr. Foshay's honor.

The New President of B.C. Electric Company

THIS is W. G. Murrin, who became president of the British Columbia Electric Railway Company, Ltd., on Jan. 1, 1929, succeeding George Kidd. Mr. Kidd on the same date became chairman of the board of directors of the British Columbia Power Corporation, the holding company of the B. C. Electric Railway Company. Mr. Murrin has been vice-president of the latter company since August, 1923.

Mr. Murrin's promotion has resulted in the advancement of two other members of the staff of the British Columbia Electric Railway Company. E. H. Adams, comptroller for the company since 1918, has been made a vice-president, and J. I. Newell, electrical superintendent for the past ten years, also has been made a vice-president. Mr. Adams has been with the company since 1908, when he entered its employ as a clerk in the secretary's office in London. Mr. Newell joined the technical staff in 1910.

Good Progress Being Made in Salt River Valley

Good progress is being made by the Salt River Valley Water Users Association, Phoenix, Ariz., in its work of extending its distribution system throughout the valley, as a result of which electric power will be carried to the homes of more than 500 ranchers. The construction work is being carried out in sections, with a view to completing the wiring of the entire valley at the same time.

To carry the transmission lines the association is erecting 8,000 steel poles. With the aid of mechanical pole diggers, the poles are being installed at the rate of 60 a day. Steel poles have been installed in the Scottsdale area, and the work is now going ahead on the north side of the Glendale district.

Plans include the construction of nine substations.

Idaho Town Votes Against Municipal Power Plant

A municipal power plant proposal at Buhl, Idaho, was defeated in a recent election. Sentiment for the municipal power plant appeared to be less than it was in 1927, when a $65,000 bond issue was passed for the purpose of acquiring the distribution system. At that time a substantial majority favored the plant.

The total ultimate cost of the plant was estimated at $165,000, the plan being that it would pay for itself in six years, after which it would bring a substantial income each year to the city. Failure of the recent measure nullifies the passage of the bond issue as the bonds have not been sold.

Novato Utilities Company Bought by Pacific Gas and Electric Company—The Pacific Gas and Electric Company has been authorized by the California Railroad Commission to purchase, acquire and hold all of the outstanding stock of the Novato Utilities Company.

FINANCIAL NEWS

Edison Co. Approves Budget of $29,206,214 for 1929

The board of directors of the Southern California Edison Company has approved a budget of $29,260,214 for the year 1929, according to announcement of R. H. Ballard, president. These expenditures during the coming year will be largely for reinforcement and extension of the existing distribution system and will be a part of the five-year $130,000,000 expansion program outlined by the company last year.

The 1929 appropriation will be allotted to the 32 districts through which the company operates and to the Big Creek-San Joaquin and Long Beach generating plants for expansion of service facilities and continuation of generating development.

System improvements for the various districts scheduled in accordance with the new budget include the construction during the year of twelve new substations, new sub-offices and three new stores and garages, in addition to the general reinforcement of the distribution lines.

During 1928, the first year under the company's new program which it termed "the commercial era," its new

business sales have totaled 300,000 hp. in electrical energy, an increase of 40 per cent over the previous year. The plans for 1929 call for 375,000 hp. in new business.

Decision Sets Precedent for 7 Per Cent Rate of Return

A decision that is considered of widespread importance to public utilities is that recently rendered by the California Railroad Commission in the matter of fixing the rates for service of natural gas in Ventura City and County by the Southern Counties Gas Company. The commission decided unanimously that the rate of return of 7 per cent per annum on capital invested, in the case of a stable and established utility like the Southern Counties Gas Company, is reasonable, instead of allowing a return of 7½ or 8 per cent as heretofore.

Importance attached to the decision is due to the fact that it marks a precedent in favor of 7 per cent rate of return on the capital invested by a public utility, in view of the "marked decline in the cost of money" during the last few years. The commission held that with the lower rate of return it would be possible for the utility to obtain the needed capital to function properly.

Lighting Rates Reduced by Puget Sound Company

Reductions in residential and commercial lighting rates, estimated to total more than $220,000 annually, affecting all customers of the Puget Sound Power & Light Company, except those within the city limits of Seattle, have been announced by A. W. Leonard, president of the company.

The reductions in residence and commercial lighting charges range from ½ to 1 cent per kw.-hr. in the primary rate, and in certain cases the secondary rate also has been reduced. Establishment of a combined rate for electric cooking and lighting, by which all electric service in the home and on the farm may be furnished through a single meter, also has been announced. Increased use of electric energy through electrical appliances in homes and extensive use for farm work has made the reductions possible, Mr. Leonard declared.

The new combined rate whereby all service in the home and farm may be combined on a single meter is based on a primary charge ranging from $1.25 to $1.75 a month, plus 3 cents per kw.-hr. for the first 150 kw.-hr. and 2 cents per kw.-hr. for all current used in excess. The purpose of the rate is to place the farm as nearly as possible upon the same plane as the factory in the use of electric service, and permits the unlimited use of power for farm work, Mr. Leonard stated.

Mr. Leonard pointed out that during the 30 years the company has been serving the people of western Washington there has never been a rate increase.

The combined rate became effective Jan. 1, and the general rate reduction will go into effect after Feb. 1.

Salt River Valley Assn. Reduces Indebtedness

In payment of construction charges due Dec. 1, 1928, the Salt River Valley Water Users' Association, Phoenix, Ariz., has sent to the Bureau of Reclamation its check for $609,553.67. This payment, together with two previous payments in July and October, brings the total payments from this project last year to nearly $1,759,000.

The association originally owed the federal government $10,166,000. To date it has repaid $5,286,000, or more than half. The reduction of this project's indebtedness to the government during the past year amounted to about 30 per cent.

General Electric Company Dividends Declared—The regular dividends of the General Electric Company were declared at a meeting of its board of directors on Dec. 7, 1928, amounting to $1 per share on the common stock and 15 cents per share on the special stock, payable Jan. 25, 1929, to stockholders of record as of Dec. 19, 1928. In addition an extra dividend of $1 per share, payable on the same date, was declared on the common stock from the surplus of the company accumulated from the financing of time installment sales.

Pacific Gas and Electric Company Plans to Sell Additional Stock—Application has been made to the California Railroad Commission by the Pacific Gas and Electric Company for authority to issue and sell 284,450 shares of its common capital stock, par value $25 per share, or a total of $7,111,250, to its stockholders as of record at the close of business Feb. 8, 1929, in the ratio of one share of new stock for each ten shares already held. The company proposes to use the proceeds derived from the sale of the stock for the purpose of financing in part unreimbursed capital expenditures on its own system and that of the Mount Shasta Power Corporation, and also new expenditures during the first quarter of the year 1929, aggregating $20,126,187.

Edison Company Secures Extension of Time on Stock Sales—An extension of time until Dec. 31, 1929, has been granted by the California Railroad Commission to the Southern California Edison Company within which to issue and sell stock heretofore authorized by the commission, and an extension of time until Dec. 31, 1933, within which to issue and sell certain other capital stock heretofore authorized by the commission.

Power Company Makes Initial Payment on Contract With Irrigation District—An initial payment of $190,208 recently was made by the Pacific Gas and Electric Company to the Nevada Irrigation District, situated in Placer and Nevada Counties, Calif., under a 50-year contract existing between the irrigation district and the power company. The payment covers water delivered by the district to the power company for use in the five power plants of its Drum division.

Pacific Coast Electrical Association

Section Announces Program for Conclave Jan. 17-18

An attractive program is being planned for the Commercial Section conclave to be held in Los Angeles Jan. 17-18. As tentatively outlined by J. F. Pollard, section chairman, the following features have been scheduled:

At a general session which will open 9:30 a.m. Jan. 17, W. R. Chawner, The Southern Sierras Power Company, chairman, competitive power committee, will report on the meeting of the National Power Committee which he recently attended in Chicago. W. L. Frost, Southern California Edison Company, will present a film taken at the Edison Electric Appliance Company's range campaign meeting which visualizes its method of putting on a big electric range campaign. Then Prof. Ben. D. Moses, executive secretary, California committee on the relation of electricity to agriculture, will talk on the work being carried on by that committee. Following Professor Moses will come a talk by G. B. Buck, general new business manager, Public Service Company of Colorado, Denver, on a subject not yet announced.

Following luncheon, at which there will be entertainment features but no scheduled speech, the afternoon session will be given over to a joint meeting with the Western Metal Congress at the Shrine Auditorium. The program includes an address by Paul M. Downing, vice-president, Pacific Gas and Electric Company, and president, Pacific Coast Electrical Association; an illustrated talk on "Electric Heat as Applied to Industry," to be given by C. L. Ipsen, consulting and designing engineer, General Electric Company; a paper on "Design as Applied to Arc Welded Construction," to be delivered by Gilbert D. Fish, Westinghouse Electric &

Manufacturing Company; and a presentation of the N.E.L.A. industrial heating film.

Friday morning, Jan. 18, has been set aside for individual committee meetings from 9:30 a.m. to 12:15 p.m. At luncheon a short talk will be given by E. B. Criddle, The Southern Sierras Power Company, vice-president of the P.C.E.A. Further committee meetings will be held from 1:30 to 3 p.m. when a general session will be held, with reports of progress by the bureau chairmen and a closing talk by a merchandising expert who has not yet been announced.

Electric Heating Discussed at Committee Meeting

Taking advantage of the fact that a number of people connected with electrical heating were in the vicinity, H. H. Douglas, Southern California Edison Company, chairman of the electric heating committee of the Commercial Section, P.C.E.A., called a meeting of his committee on Dec. 12 in Los Angeles.

Impromptu speakers at this meeting were W. A. Cyr, Electrical West, who told of the illustrated talk given under the auspices of the Electric Heating Association, "The Amazing Story of John Smith"; Ray Turnbull, Edison Electric Appliance Company, who urged that selling of electric heating be done by the positive method rather than the negative one of trying to tear down other forms of heating; P. P. Pine, San Diego Consolidated Gas & Electric Company, who said his company was starting the sale of electric heating by introducing it in several schools in the county.

Mr. Douglas urged more work with architects and engineers because of the strategic position these people occupy in the planning of homes and buildings. H. L. Stiles, representing the Hotpoint factory of Chicago, spoke briefly, stating that operating and installation costs of electric heating could be estimated more accurately even than other forms of heat. A. W. Elliott, Bureau of Power and Light, Los Angeles, described the lighting school recently held jointly with the Edison company and the Los Angeles Gas and Electric Corporation and said a similar school would be held on electric heating early in January. William S. Fleming, The Southern Sierras Power Company, stated that the new rates recently inaugurated by that company would make electric heating more available and laid particular stress on the importance of selling equipment adequate to take care of the job. Frank Short, representing the State Accident Commission, and Harry Beecher, chief instructor, City of Los Angeles, mentioned certain features of the revised 1928 code which would make easier the selling of electric heating. A general discussion followed on demand factors and the necessity of power companies making tests of apartment installations in order to provide a basis for any future requirements or changes in wiring regulation. John Mead, special agent connected with the rate department of the Edison company, pointed out that if more electric heating were sold, further reductions in rates would be justified.

The meeting was attended by approximately thirty representatives of various branches of the industry.

N.E.L.A. Convention Dates—June 3-7, 1929, has been set as the period of the fifty-second annual convention, National Electric Light Association. The meeting will be held in Atlantic City.

Northwest Electric Light & Power Association

Puget Sound Women Active in Committee Work

That the women of the Puget Sound Power & Light Company take an active interest in the work of the women's committee is evidenced by two meetings held recently, one the third annual conference and the other an appliance demonstration at Chehalis.

The third annual conference of representatives of women's committees, all districts, was held in Seattle as an all-day session.

Mrs. Nell Laws, representative of the Puget Sound Power & Light Company on the Northwest Electric Light and Power Association women's committee, presided. She gave an outline of the national women's committee meeting held in Chicago in September, as well as of the Northwest women's committee meeting held in Aberdeen in October. The main subject to be stressed on the program for the current year as outlined by the national committee is "Economics of Utilities," which would include a further study of matters relating to financing, rates, regulation, taxes, customer ownership of securities and similar subjects. It was also stated that working toward improvement of public good will and better service to the customer are always foremost in the plans for activity.

All districts reported keen interest in women's committee work and good co-operation from the various organizations. The work of the district committees was fully discussed and helpful ideas were exchanged.

Those in attendance included the following from the committees in the several districts: northern district, Bellingham—Miss Florence Larsen, chairman; Miss Fern Wheeler, secretary; northeastern district, Everett—Miss Clara Hansen, chairman; Miss Maxine Merz, secretary; eastern district, Wenatchee—Miss Gertrude Commerford, chairman; Mrs. Aline Tworoger, secretary; western district, Bremerton—Mrs. Ruth Inkster, chairman; Miss Florence Eade, secretary; southern district, Chehalis—Miss Lois Anderson, secretary; central district, Seattle—Mrs. Harriet White, chairman; Mrs. Lillian Brown, secretary.

About 350 people responded to the invitation of the women's committee of the Puget Sound Power & Light Company, southern district, at Chehalis, Wash., to attend a recent electrical appliance demonstration at the company's salesroom on Nov. 23 from 2 to 5 p.m. and 5 to 9 p.m.

Among the electrical appliances demonstrated were a range, a refrigerator, a vacuum cleaner, a washing machine, an ironer, a toaster, a cooker, a waffle iron, a percolator and a sandwich toaster. Refreshments made in the different appliances were served during the afternoon and evening by the member of the women's committee who was prepared to take charge of the particular appliance.

The Thanksgiving idea was carried out in decorations. The committee members wore smocks in the pastel shades and the general effect was very pleasing. Each guest registered on arrival, and at the close of the demonstration a name was drawn from a mixture of names which had been placed in the washer and the lucky person received a large Thanksgiving turkey.

Everyone concerned is highly pleased over the success of this initial women's committee effort in the southern district. Great credit is due all the nineteen members who assisted. Miss Rosemary Nacht was chairman of the arrangements committee.

General Records Committee Personnel Announced

O. W. Bennett, chairman, general records committee, Accounting Section, Northwest Electric Light and Power Association, announces that the following comprise the complete personnel of that committee:

Chairman—O. W. Bennett, Puget Sound Power & Light Company, Seattle; vice-chairman—C. F. Kirchhaine, Puget Sound Power & Light Company, Bellingham; C. E. Gieseker, Washington Water Power Company, Spokane; G. F. Mackenzie, Pacific Power & Light Company, Portland; Lester G. Park, Portland Electric Power Company, Portland.

Northwest Association to Convene in Seattle—The annual convention of the Northwest Electric Light and Power Association is to be held at the Olympic Hotel, Seattle, June 26-29, 1929.

Meetings

Coming Events

Artistic Lighting Equipment Association—Annual meeting at Cavalier Hotel, Virginia Beach, Va., Feb. 5-7, 1929.

California Electrical Bureau—Meeting of advisory committee at Jonathan Club, Los Angeles, Jan. 7, 1929.

National Electric Light Association—Fifty-second annual convention in Atlantic City, N. J., June 3-7, 1929.

New Mexico Utilities Association—Annual convention, Franciscan Hotel, Albuquerque, N. M., Feb. 18-20, 1929.

Northwest Association of Electrical Inspectors—Annual convention and exhibition at Vancouver Hotel, Vancouver, B. C., Sept. 9-11, 1929.

Northwest Electric Light and Power Association—Annual convention at Olympic Hotel, Seattle, Wash., June 26-29, 1929.

Pacific Division, National Electrical Wholesalers Association—Annual meeting at Hotel Del Monte, Del Monte, Calif., Jan. 31-Feb. 2, 1929.

Pacific Coast Electrical Association—Annual convention at Hotel Del Monte, Del Monte, Calif., June 19-22, 1929.

Commercial Section—Conclave in Los Angeles, Jan. 17-18, 1929.

Engineering Section—Conclave in Los Angeles, Jan. 16-18, 1929.

New Officers of East Bay Electric Club Elected

At a reorganization of the East Bay Electric Club, formerly the Electric Club of Oakland, Calif., Harold F. O'Brien, sales engineer, Westinghouse Electric & Manufacturing Company, Emeryville, was elected president, succeeding U. K. Petersen of the Quality Electric Company, resigned. The following committee chairmen were appointed: program — Stanley Walton, Great Western Power Company; membership — Joseph Miserez, manager, Graybar Electric Company; reception—Tom Thompson, Graybar Electric Company; public policy—H. B. Bell, vice-president, Key System Transit Company; publicity—Lou Galbraith, Pacific Gas and Electric Company (tentative).

The East Bay Electric Club meets every Monday at 12:15 p.m. in the West Room of the Hotel Oakland, Oakland, Calif.

Engineers of Oregon Form New Organization

"Professional Engineers of Oregon" is the name of a new engineering organization formed at a meeting in Portland, Ore., on Dec. 5, at which 51 engineers were in attendance. The objects of the new organization were defined as follows:

"To make a strong and persistent effort to assist engineers in developing a professional fellowship.

"To impress upon all organizations and municipalities, especially when so requested by their engineers, the desirability of employing consulting service, when warranted by the importance of the work, in the interest of economy and public safety.

"To maintain an employment service.

"To support the law for the registration of engineers, assist in every manner possible to reduce the number of violations, and make the law more effective.

"To work for adequate compensation for engineers.

"To promote desirable forms of publicity for the engineering profession.

"To take an active part in civic questions having engineering aspects."

Meetings are to be held monthly, local branches or chapters are to be encouraged whenever ten or more members organize and apply for a charter, and the "Pacific Engineer" is to be the official organ of the society. The next meeting will be held Jan. 8. J. C. Stevens is president, and Orrin E. Stanley is secretary of the new organization.

New Officers of Electrical League of Utah Elected

At the annual election of the Electrical League of Utah, the following officers were chosen for the ensuing year: president—J. M. Perlewitz, manager, Graybar Electric Company; vice-president—G. W. Forsberg, manager, Wasatch Electric Company; secretary and treasurer—M. L. Cummings, Jr., Utah Power & Light Company.

The following members of the board of trustees also were elected: wholesalers—W. J. Berryman, Mine & Smelter Supply Company; Frank Edwards, Motor Equipment Company; C. B. Hawley, Intermountain Electric Company; J. M. Perlewitz, Graybar Electric Company; contractor-dealers—Blaine Grey, Blaine Grey Electric Company; G. W. Forsberg, Wasatch Electric Company; R. R. Reid, R. R. Reid Electric Company; G. R. Randall, Salt Lake Electric Supply Company; manufacturers—B. C. J. Wheatlake, General Electric Company; W. A. Moser, Westinghouse Electric & Manufacturing Company; R. Ackerman, Benjamin Electric & Manufacturing Company; Leo Brandenburger, electrical engineer; central station—D. C. Green, H. M. Ferguson, R. M. Bleak and C. A. Wolfrom, all of the Utah Power & Light Company; telephone company—Sam Jones, Intermountain Telephone & Telegraph Company.

R. E. Folland was reappointed executive secretary for the ensuing year.

New Mexico Utilities Association Sets Convention Date—The next convention of the New Mexico Utilities Association will be held Feb. 18-20, 1929, in Albuquerque, N. M., at the Franciscan Hotel.

A.S.M.E. Plans Six-Park Tour for Spring Meeting

A six-national-park tour is being planned in connection with the semi-annual meeting of the American Society of Mechanical Engineers to be held in Salt Lake City July 1-4, 1929. The six parks scheduled to be visited are Rocky Mountain Estes Park, Grand Canyon, Zion Canyon, Bryce Canyon, Yellowstone Park and Glacier Park. In addition, the itinerary includes the Royal Gorge, Hanging Bridge, Colorado Springs, Glenwood Springs, Pike's Peak, Garden of the Gods, Colorado Million-Dollar Highway and Niagara Falls. As the tour is now planned, it will take 30 days and cover approximately 8,000 miles. Sixteen days will be spent in the parks and four in Salt Lake City at the time of the spring meeting.

The tour is to be arranged on the all-expense plan, and the fare will include round-trip railroad and pullman transportation, tours through the parks, side trips, accommodations at the first-class hotels, and in fact all necessary expenses.

Further information may be obtained from the headquarters of the secretary, 29 West Thirty-ninth St., New York City.

Children's Christmas Party Given by S. F. League

Following its annual custom, the San Francisco Electrical Development League held a most successful Christmas party for the children of its members in the ball room of the Palace Hotel, Dec. 17.

Many colored balloons, greens and a beautifully lighted Christmas tree made the scene a festive one. About 520 enjoyed the luncheon, which had been selected as particularly suitable for small stomachs, and then followed a program of entertainment also chosen to amuse the children although the grown-ups enjoyed it, too. Joseph Thompson, president, Pacific Electric Manufacturing Corporation, in the role of Santa Claus, gave each child a box of candy.

A great deal of credit for the success of the affair is due Ernest Ingold, president, Ernest Ingold, Inc., who, as chairman of the program committee, had full charge of arrangements.

Aritstic Lighting Equipment Association to Convene—The annual meeting of the Artistic Lighting Equipment Association is to be held at the Cavalier Hotel, Virginia Beach, Va., Feb, 5-7, 1929.

Rural Electrification Short Course Success—Forty-six persons enrolled in the short course in rural electrification recently given at the University of California, Davis, through the instrumentality of the California Committee on the Relation of Electricity to Agriculture. The attendance was 92 per cent for the two days at all sessions.

Contractors, Dealers and Inspectors

New Electragist Field Plan Starts as Geisbush Joins McGraw-Hill Co.

Ushering in a new status of organization, under which more intensive local work will be carried on, the California Electragists have issued important announcements as to changes in personnel effective Jan. 1, 1929.

C. J. "Cy" Geisbush, state manager and prime mover in the association's extensive contractor-dealer field activity, has announced his resignation to accept a position as Eastern sales manager for "Electrical West." With his retirement from the Electragist field staff Mr. Geisbush will set in motion a plan of field work for the association which he has had in mind for some time. It is a plan which promises more intensive work in somewhat more restricted fields but from which greater results should come, according to Mr. Geisbush.

"Cy" Geisbush, state manager of the California Electragists, who has resigned to join the staff of ELECTRICAL WEST.

The plan will place Northern Division activities directly under the responsibility of George Eldridge, field secretary for that division for some years. A concentration of field work around the San Francisco Bay region, with a later development of the San Joaquin and Sacramento Valley regions by another field man, is contemplated.

To take up the Southern Division responsibilities a man whose early training was closely allied with that of Mr. Geisbush has been chosen. Frank J. Connelly, successful orange grower of Kern County, former supervisor of the vocational rehabilitation work of the U. S. Veterans' Bureau for the trade and university courses in the Los Angeles and southern California area for two years, and prior to that business agent for the electrical workers' union for eighteen months in Los Angeles, a position to which Mr. Geisbush succeeded, will take over the secretaryship of the Southern Division of the California Electragists.

Mr. Connolly was born in 1891 at Waltham, Mass. After completing high school he took night courses for four years at Lowell Institute, Boston, while serving an apprenticeship in electrical construction. He worked for several years as a journeyman electrician, then joined the U. S. Navy at the outbreak of the World War and served as chief electrician on the U.S.S. "Virginia" and U.S.S. "Idaho." Later he was naval electrical instructor at the U. S. Naval Academy at Annapolis and with the Sperry Gyroscope Company at Brooklyn, N. Y.

After discharge from the navy he worked again as journeyman electrician in construction work in Los Angeles which led to his being selected to serve as business agent for the union. He left this position to become supervisor of trade instruction for the Veterans' Bureau, already referred to. After two years in this capacity he interested himself in orange farming and purchased a ranch in Kern County, near Bakersfield, which he plans to still retain.

As orange grower he has been prominently identified with public movements, and is a director of the Kern County Chamber of Commerce, of the Richgrove Jasmine Citrus Association and the Tulare County Fruit Exchange.

He entered the Electragist field staff in November, acquainting himself with details under Mr. Geisbush's guidance. He attended the state convention at Fresno where an opportunity was given him to meet those attending. It is expected that an assistant will be appointed some time in the future, as conditions warrant, to divide with Mr. Connolly the coverage of southern California.

In accepting his new connection Mr. Geisbush leaves the Electragist organization with a gap which will be hard to refill. His career has been little short of brilliant and his constructive program has swept the California Electragists from obscurity into a position as one of the most potent factors in Western electrical trade relationships. Seeking always the most constructive means of treating with a difficulty between contractor-dealers themselves or between them and other branches of the industry, he has initiated many movements which have been so far reaching in their effect as to affect national trade groups and generally improve conditions.

While "Cy" Geisbush is as familiar as an old shoe and known and liked by everyone in all branches of the electrical industry in California, a brief review of his career will serve to mark off the mileposts in his Electragist activities.

Born in Milwaukee, Wis., and educated in the schools of that state, his first job was as apprentice in the Hawthorne works of the Western Electric Company. Following that his experiences include construction work of various types in many cities as electrician. During the war he served in the U. S. Navy as electrician, attended the electrical school at Hampton Roads, Va., and after leaving the navy worked his way West to California in 1920.

After a short period of substation installation work with the Southern California Edison Company, during which he was burned, he was elected business agent of Local 83 of Los Angeles, a post he held for eighteen months. In September, 1923, he was made manager of the Electrical Safety Exchange at San Pedro, his first contractor activity. He guided that body so successfully that he was asked to reorganize the Southern California Contractors and Dealers Association, out of which grew the affiliation with the Association of Electragists, International, the formation of the California Electragists and the Northern and Southern Divisions of it. Mr. Geisbush was executive secretary of the Southern Division until June, 1927, when he was made state manager.

In the latter capacity his work carried him over practically the entire state. The practical problems of distance and infrequent contact led him to work out the present plan by which more intensive work will be done in more closely associated centers until such time as means are found for the more complete statewide program.

Frank J. Connolly, new field representative of the California Electragists, Southern Division.

President Ed Martin of the California Electgagists, in expressing the regrets of the association over the loss of so able a leader, declared that the association would not altogether lose the influence of Mr. Geisbush toward better industry relations in his new connection.

The Utah County Electrical Engineers and Dealers Association held a meeting at Pleasant Grove, Utah, recently to discuss changes in the national electrical code. Dealers from Provo, Springville, Spanish Fork, Payson, Lehi, American Forks, Pleasant Grove, and representatives of the Utah Power & Light Company, were present at the meeting. A plea was made to the public for the use of approved wiring devices and equipment on the basis of safety and efficiency of operation.

Golden Way Radio and Electric Store, opened some time ago by S. C. Mansfield at Atascadero, Calif., was recently remodeled and enlarged to take care of Christmas trade. A partition was moved at the rear of the store allowing more room for display of electrical merchandise and radio, which is all that is handled by this company. No wiring is done except in connection with the installation of radio sets. Refrigerators are to be handled next year.

In a petition to the Seattle City Council, signed by twenty leading electrical firms in the city, the council is asked to grant wage increases to electrical inspectors for the city's building department. The petition declares the Seattle inspectors are paid less than any other men in the same class of work on the Pacific Coast.

Meacham & Babcock, electrical contractors, Mutual Life Building, Seattle, recently received contract for electrical wiring in the $3,000,000 store building under erection by The Bon Marche.

D. D. Sturgeon, Electragist of Denver, Colo., recently was awarded the contract for the new Denver Municipal building.

J. J. Agutter & Company, Seattle, received the contract for wiring of the new barrack buildings at Fort Lewis, Wash., a wiring job running over $10,500 in buildings to cost $500,000.

Carrol O. Vinson, organizer of the electrical contracting and motor firm of **Vinson Brothers and Carter,** and veteran electrical man of Phoenix, Ariz., was killed by electric shock while attempting to repair a starter at a cotton industrial plant in that city, Oct. 3, 1928. Called to repair a "dead" starter he was killed by a shock of 2,300 volts received from a second starter from which he was removing a coil to make the repair and which he thought to be disconnected. Artificial respiration failed to revive him.

E. H. Dietrich, electrical contractor of Escondido, Calif., recently finished wiring the new packing plant of the Escondido Co-operative Citrus Association.

New Home of National Electragist Head

Not long ago Clyde Chamblin, president of the Association of Electragists, International, moved into this new store at 639 Mission St., San Francisco.

The Electric Shop at Santa Maria, formerly located at 120 Main St., with the retirement of **L. E. Smart** from the partnership moved to a new and more favorable location at 119 South Broadway, Santa Maria. A. E. Ford, who acquired complete ownership of the company upon the retirement of Mr. Smart, due to his wife's health, has arranged a number of unusual features for the display of merchandise at this store. The move to new quarters was made in time to take full advantage of the Christmas trade.

H. W. Farmer, recently connected with Otto K. Oleson of Hollywood, has just acquired the ownership of Barnes Bros., an electrical contracting and merchandising firm at 1399 North Lake Ave., Pasadena. Before coming to California Mr. Farmer was in business in Kansas City as an electrical contractor and dealer and electrical engineer. Barnes Bros. was formerly owned by **H. W. Barnes,** who recently became assistant manager of the Association of Electragists, International, and his brother, **Marvin G. Barnes,** who sold the business to Mr. Farmer. Mr. Barnes has announced no plans.

T. M. Robinson, electrical contractor of Fresno, is installing a new electrolier system in the city of Los Banos. The city has retained **Mr. Ramsell,** electrical contractor-dealer as well as inspector for the city, to supervise the installation.

The Lee Grove Electric Company, formerly at 21 Central Ave., Tracy, Calif., recently moved into a new and attractive store at 141 Central Ave. The new store gives more facilities for displaying electrical appliances as well as increased shop facilities.

The Caldwell Electric Company, Inc., for two and a half years located at 2762 First Ave. South, Seattle, recently moved across the street to 2737 First Ave. South, where larger quarters and more display space are available for the growing concern.

Two interior views of the California Electrical Construction Company's new store. Mr. Chamblin's office is located on the mezzanine at the rear of the picture on the left. Heating specialties, in which the company is very active, are seen attractively arranged in the picture at the right.

Personals

Los Angeles Water Bureau's Chief Is H. A. Van Norman

ON DEC. 1 H. A. Van Norman became chief engineer and general manager of the Los Angeles Bureau of Water Works and Supply, succeeding **William Mulholland,** whose resignation was announced in Electrical West Dec. 1, p. 364.

H. A. VAN NORMAN

For the past 21 years Mr. Van Norman has served the Bureau of Water Works and Supply in various capacities, this period covering the building of the Owens Valley Aqeduct, on which he was construction engineer, and the planning of the proposed Colorado River aqueduct. In recent years he has held the position of assistant chief engineer and general manager of the water bureau under Mr. Mulholland.

The only interruption in Mr. Van Norman's service with the Los Angeles Water Department was a leave of absence of less than two years granted to allow him to take charge of constructoin of a $12,000,000 trunk sewer project for the Los Angeles city engineering department.

J. M. DePue, who formerly represented the Chicago-Jefferson Fuse & Electric Company in Denver, is now a salesman for the General Electric Supply Corporation with headquarters in Durango, Colo.

H. E. Greenwood, general manager, Brazilian General Electric Company, Rio de Janeiro, recently arrived in San Francisco on a business trip to the Pacific Coast.

E. A. Sperry, president, Sperry Gyroscope Company, New York, has been elected president of the American Society of Mechanical Engineers. Among the new vice-presidents elected is **R. L. Daugherty,** professor of mechanical and hydraulic engineering, California Institute of Technology, and the new managers include **Ely C. Hutchinson,** president, Pelton Water Wheel Company, San Francisco.

J. F. Rowe, for the past five years lineman for the Utah Power & Light Company, has been appointed district representative for the company at Eureka, Utah. He succeeds the late H. M. Bradley.

Miss Thelma Kelly, for a number of years employed as saleswoman in the Walla Walla district of the Pacific Power & Light Company, has been placed in charge of the company's home service department.

W. E. Houghton, vice-president and treasurer, and **R. U. Fitting,** valuation manager, respectively, Los Angeles Gas and Electric Corporation, recently made a trip to Washington, D. C.

L. F. Leurey Presides Over S. F. Engineers' Club

ADDING one more to his already long list of activities, Louis F. Leurey now is guiding the destinies of the Engineers' Club of San Francisco as its president.

As his profession is that of consulting electrical engineer, Mr. Leurey, of course, is particularly well known in the electrical industry. Prior to his coming to San Francisco he held important engineering positions with the New Orleans Railway & Light Company, Spokane & Inland Railway, and the British Columbia Electric Railway Company, Ltd. During the Panama-Pacific International Exposition in San Francisco he served as assistant chief mechanical and electrical engineer in charge of all field installations and operations.

Officiating as president is a task not entirely new to Mr. Leurey for during 1923 he was president of the San Francisco Electrical Development League, an organization in which he has always played a prominent part. Mr. Leurey is also a member of the Illuminating Engineering Society, of the Pacific Coast Electrical Association, and the American Institute of Electrical Engineers.

LOUIS F. LEUREY

Warren H. McBryde, consulting electrical engineer of San Francisco, is beginning a six-months trip around the world, traveling by way of Manila, Peking, Calcutta and through the Suez Canal to Europe. Mr. McBryde plans to study, in conjunction with foreign trade, industrial development and engineering progress in port and harbor facilities, inland waterways and railway transportation.

W. F. Raber, vice-president and general manager, San Diego Consolidated Gas & Electric Company, has been elected president of the San Diego-California Club for the ensuing year. The club is a subsidiary of the San Diego Chamber of Commerce and acts in the capacity of that organization's advertising-publicity agent.

Lafayette Hanchett, president, Utah Power & Light Company, Salt Lake City, recently returned from a four-months tour of Europe.

Obituary

Grant Guthrie, secretary-treasurer, the Electric Supplies Distributing Company, San Diego, Calif., died in that city Dec. 2.

Leo H. Susman, general attorney for the Pacific Gas and Electric Company, San Francisco, died suddenly Dec. 19 in that city. In 1904 Mr. Susman entered the law department of the California Gas and Electric Corporation, the predecessor of the Pacific Gas and Electric Company, and rapidly advanced from a minor position to that of chief assistant and then to head of the law department and the position of general attorney for the company.

William Granville Jack, since 1923 manager of the land department of the Pacific Gas and Electric Company, San Francisco, died in that city Dec. 18 following a heart attack.

C. E. Kunze, editor of the Pacific Gas and Electric Company's house organ, "P. G. and E. Progress," died of pneumonia in San Francisco Dec. 21. Mr. Kunze, a newspaper man of many years' experience, was political editor of the San Francisco Call for a number of years and also had worked on several other San Francisco and Oakland newspapers.

Richard M. Kerschner, for the past sixteen years associated with Hubbard & Company, Pittsburgh, Pa., died of a heart attack on Dec. 8 at his home in Zelinople, Pa. In 1914 Mr. Kerschner joined the sales department of Hubbard & Company and later became sales manager. In 1924 he supervised the building of the company's factory at Oakland, Calif., and remained in charge there until 1927 when he returned to Pittsburgh to assume charge of the department of development research, a position in which he was active up to the time of his death.

Manufacturer & Distributor

Jones-Lyman and Squires Co. Form New Company

Announcement has been made by Jones-Lyman & Company, Inc., and H. B. Squires Company, San Francisco and Los Angeles, that they have formed and jointly own a new company to be known as the Utilities Equipment Corporation. S. P. Russell, president, H. B. Squires Company, will be president of the new company, Emmett H. Jones, president, Jones-Lyman & Company, Inc., will be vice-president and treasurer, and Oliver B. Lyman, who is in active charge of Jones-Lyman & Company's business in San Francisco, also will serve as vice-president.

The Utilities Equipment Corporation will have offices adjoining the present offices of Jones-Lyman & Company, Inc., in the Russ Building, San Francisco, and in the Bartlett Building, Los Angeles. E. S. Moreland, of the H. B. Squires Company, will be a member of the staff of the Utilities Equipment Corporation, and W. W. LaBarr, formerly manager of the Packard Electric Company in Los Angeles, will be manager of the new company in that city, working directly under Mr. Jones.

The Utilities Equipment Corporation has been appointed by the American Brown Boveri Electric Corporation as its sales agent for California, and the new company will handle the sales of that corporation's products, including those of its Packard Transformer Division. Other lines handled by the Utilities Equipment Corporation will be those of the Condit Electrical Manufacturing Corporation, Boston, Railway & Industrial Engineering Company, Greensburg, Pa., the Metropolitan Device Corporation, Brooklyn, N.Y., and also for northern California only the products of the I-T-E Circuit Breaker Company, Philadelphia, and the Sundh Electric Company, of Newark, N.J.

Edison Appliance Co. Field Men Meet in Salt Lake

Salt Lake City recently was the scene of a joint meeting of all the field representatives of the Edison Electric Appliance Company's two Western districts, the Salt Lake district, of which B. E. Rowley is manager, and the Pacific Coast district, which is managed by R. W. Turnbull. The meeting lasted four days and consisted largely of a discussion of plans for 1929.

Officials from the Chicago office in attendance included A. D. Byler, vice-president and general manager; Grant Call, manager heavy duty division; P. L. Miles, manager range division; M. H. Beekman, manager appliance division; and D. C. Marble, manager service department. P. H. Booth and E. H. Richardson, vice-presidents with headquarters at the factory in Ontario, Calif., also attended the conference.

Timken Co. Opens Two New Coast Offices.

Through a reorganization affecting its Pacific Coast territory, the **Timken Roller Bearing Company**, Canton, Ohio, has established two new permanent offices in Los Angeles, one at 1361 South Figueroa St., and the other in Seattle at 321 South Pine St.

The former will be in charge of Roy Cross and the latter in charge of Marshall Cooledge. G. C. McMullen will remain as district manager of the company's San Francisco office.

Manufacturers' Representative Adds New Line—Effective Dec. 1, C. Dent Slaughter, 314 Twelfth St., San Francisco, has become the Pacific Coast representative of the **Chicago Steel Tank Company**, Chicago.

Joins Staff of Refrigerator Distributors—Stuart S. Goode, formerly with the Los Angeles organization of the General Electric Company, has joined the staff of **J. O. Case, Inc.**, Los Angeles distributor of Servel refrigerators.

Vancouver Company Plans New Building—Construction of a fireproof warehouse and office block to cost approximately $30,000 is being planned by the **Electrical Distributors, Ltd.**, 1259 Granville St., Vancouver, B. C.

Hoyt Heater Co. and Wood Coast Interests Merged

Effective Jan. 1, the **Hoyt Heater Company**, San Francisco, Oakland, Los Angeles, San Diego and Portland, has been merged with the Pacific Coast interests of the **John Wood Manufacturing Company.** Both concerns have been actively engaged in the manufacture and sale of water heaters for many years.

The new company will be known as the Hoyt-Wood Manufacturing Company. It will be a California corporation with E. S. Hoyt, Jr., president, R. C. Hoyt vice-president, and G. L. Howard secretary and treasurer. The board of directors will consist of the above officers, together with Frank Sutcliffe, president of the John Wood Manufacturing Company and the Metal Wares Corporation, and J. F. Dunn, formerly Pacific Coast manager of the Wood company. Mr. Dunn will be in charge of distribution for the new concern in the Southwest, while R. C. Hoyt will continue to head the organization in the northern section.

To Represent Eastern Firm in Five States—**B. W. Kerr**, president, **Railway & Industrial Engineering Company**, Greensburg, Pa., has announced the appointment of E. B. Sawyer as the company's representative in the states of Colorado, Utah, Idaho, Montana and Nebraska. Mr. Sawyer has established headquarters at 724 U. S. National Bank Bldg., Denver.

New Coast Manager for Hubbard & Company—W. W. Glosser, formerly New York manager for **Hubbard & Company**, has been appointed Pacific Coast manager to succeed N. C. Husted, who has resigned to enter into business for himself in Ohio.

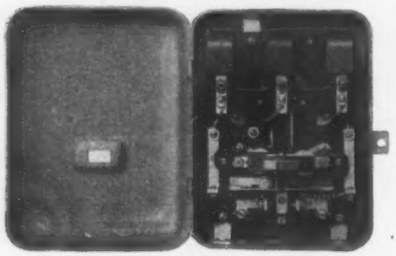
Spokane Branch of Pacific States Electric Company

THIS is the new home of the Spokane branch of the Pacific States Electric Company. The building is of brick and concrete construction. When the company moved into its new quarters it held open house with D. E. Harris, of San Francisco, president of Pacific States Electric Company, and Harry B. Rogers, manager of the Spokane branch, as hosts.

New Equipment

Magnetic Switch

A new magnetic switch, combining needed features of roominess, accessibility and ease of installation, has been placed into production by the **Diamond Electrical Manufacturing Company,** 1318 Sixteenth St., Los Angeles. This switch, type KXR, has been designed to connect directly across the line in starting and is adaptable to the control of single and polyphase squirrel-cage induction motors. It is provided in sizes up to 7½ hp. for single and polyphase motors.

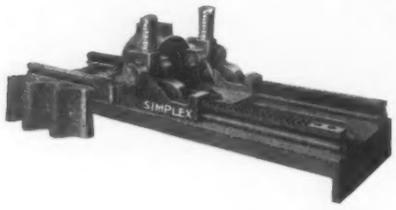


Ample room for all wiring requirements has been provided in the cabinet behind the panel. Knockouts are provided on all sides and on the back so that cable installations can be made easily and quickly. All contacts may easily be removed from the front of the panel without disturbing the wiring. The switch is provided with inverse time limit and thermal overload relay with interchangeable heating elements. The lever is of brilliant red Bakelite set integral with the Bakelite panel, and the entire panel is housed in a drawn box finished in black, baked enamel. It has no sharp corners inside or out.

Literature and price lists are now ready for distribution by the offices of the company at Los Angeles, San Francisco and Houston, Texas.—Electrical West, Jan. 1, 1929.

Pipe Pushing Jack

The Simplex pipe pushing jack, manufactured by **Templeton, Kenly & Company, Ltd.,** 1020 South Central Ave.,



Chicago may be used for pushing water or gas pipe or pipe for electrical service or for oil heating supply under paved streets or alleys or under gardens or lawns, irrespective of temperature conditions. The pipe is gripped by jaws in the center of the jack illustrated, and one or two men operating each of the two levers cause the pipe to be pushed through the ground powerfully and accurately.

These Simplex jacks are built in two sizes, the No. 332 for pushing pipe of ¾ in. to 2 in. in diameter, and the No. 334 for pushing pipe of 2 in. to 4 in. in diameter, a feature being that each size of pipe requires a set of jaws to conform to the size of pipe, and thus the crushing or distorting of the pipe is avoided.—Electrical West, Jan. 1, 1929.

Master Healthizer

An exercising, massaging and reducing machine is being marketed by **The Master Electric Company,** Dayton, Ohio. It has many uses, among them that of reducing excess weight, giving the equivalent of healthful exercise without placing any strain on the heart, helping to alleviate certain kinds of headaches, sore muscles, poor circulation and other ailments.

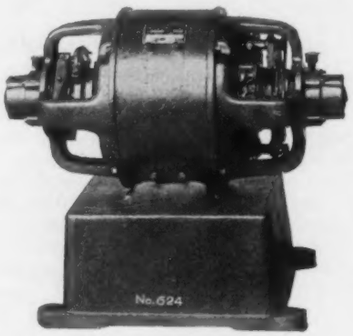
Some of the desirable features of construction include ¼-hp. Master repulsion-induction motor; length of stroke can be adjusted by the simple

turn of a wheel; working mechanism is fully enclosed so that there are no exposed parts to throw oil; it is adjustable for different heights; belt horns are shaped to give direct pull over a wide angle; the foot plate can be folded back when the machine is not in use.

The device, which can be supplied for any current specification, is finished in antique ivory. Models 100 (portable type), 150 (wall type), and 200 (floor type) are furnished complete with one 2-in. applicator, one 4-in. applicator, and one pair of hand grips. The list prices f.o.b. Dayton are, respectively, $125, $120 and $135.—Electrical West, Jan. 1, 1929.

Rotary Converter for Neon Signs

A line of inverted rotary converters, especially adapted for use with Neon signs, has been designed by **Roth Brothers & Company,** 1400 West Adams



St., Chicago. This converter is for use with the signs where direct current supply only is available, as Neon electric signs operate only on alternating current. This machine is of the tapped armature type, and by means of a transformer mounted in the base delivers full 110 volts on the alternating current side. Placing the transformer in the base of the machine makes a self-contained unit, economizes in space and simplifies installation.—Electrical West, Jan. 1, 1929.

Four-Hole Portable Ice Cream Cabinet

Announcement has been made by the **Frigidaire Corporation,** Dayton, Ohio, that it has started production on a new model four-hole portable ice cream cabinet. This model is designed for use at fairs, carnivals and other seasonal or temporary locations as well as in permanent places where this size is of sufficient capacity. It is equipped with a modified type of ¼-hp. household compressor. By use of an arrangement whereby the cooling coil of the cabinet can be removed from the side, the top of the brine tank is completely sealed so that the new model may be moved conveniently and placed in immediate service wherever there are electrical connections.—Electrical West, Jan. 1, 1929.

Welding Rod—Announcement comes from the research laboratories of **The Lincoln Electric Company,** Cleveland, Ohio, of the perfection of their most recent development, a welding electrode which will be known as "Fleet-Weld." As a result of much experimentation and research a new welding rod has been perfected which will produce a dense weld of greater ductility at greatly increased welding speeds, the company states. It has been found from recently conducted tests that in general the speed of welding has been doubled or trebled by use of the new rod.—Electrical West, Jan. 1, 1929.

Cleaning-Spraying Unit

A new portable combination cleaning-spraying unit has been placed on the market by the **P. A. Geier Company,** Cleveland. As shown in the illustration, the unit consists of a vacuum cleaner body so designed and equipped as to be conveniently slung from the shoulder on a carrying strap. The cleaning outfit includes hose and full equipment of swiveled suction and blower tools for vacuum cleaning. The spraying outfit consists of a Model D Royal Sprayer and three spare containers for holding various spray liquids. Great utility is claimed for this outfit, especially for use as a garage accessory. — Electrical West, Jan. 1, 1929.

Miniature Current Transformer

Model 539 current transformer, manufactured by the **Weston Electrical Instrument Coporation,** Newark, N. J., offers to the electrical measurement art in small-size, light-weight equipment, a reliable means of making current measurements ranging from 0.2 amp. to 200 amp. when used in combination with a Model 528 1-amp. instrument.

The following summary of characteristics has been furnished by the manufacturer: Range, amperes: self-contained 2-5-10-20—inserted primary 50-100-200; measuring range with a 1-amp. instrument, 0.2 to 200 amp.; secondary 1-amp. secondary burden, 2-volt amp. maximum; dimensions: 5½ x 4⅛ x 1⅞ in.; weight 2⅝ lb.; housed in a mottled red and black Bakelite case; switch for changing self-contained ranges; maximum working range 750 volts; tested at 4,000 volts for 1 min.; accuracy 1 per cent from 25 to 150 cycles.

Price of Model 539 transformer is $28 and of Model 528 range 1-amp. $13.50.—Electrical West, Jan. 1, 1929.

Motor-Driven Signal—A motor-driven signal which, because of its carrying and penetrating power, is particularly suitable for use in steel mills, railroad shops, foundries, cotton mills, machine shops and other similar industrial plants, is being manufactured by the **Benjamin Electric Manufacturing Company,** 120-128 South Sangamon St., Chicago. The signal, with baked black enamel standard finish, is wired with 14-in. leads and packed completely assembled and thoroughly tested. Both single and double horn projector types are available.—Electrical West, Jan. 1, 1929.

Automatic Furnace Fan—An automatic furnace fan especially designed for positive circulation in warm air heating systems has been added to its line by the **Autovent Fan & Blower Company,** 1805-1827 North Kostner Ave., Chicago. This fan is for installation in the cold air intake shoe of a furnace to create speedy, positive, equalized delivery of the warm air to individual rooms.—Electrical West, Jan. 1, 1929.

Combination Lamp and Clock—A new lamp, in the base of which a Telechron clock has been set, has been added to its line by **The Miller Company,** Meriden, Conn. The lamp is a Georgian candle-lamp in rich Colonial bronze and has a shade of Deer georgette interlined and lined with rose. It has two lights and is 23 in. high. Price $65, f.o.b. Meriden.—Electrical West, Jan. 1, 1929.

Recent Publications

Traffic Signals—Bulletin GEA-566A, superseding GEA-566, published by the **General Electric Company,** Schenectady, N. Y., is descriptive of its Novalux traffic signals. There are numerous illustrations and detailed specifications of the various types of signals. Bulletin GEA-482A, superseding GEA-482, describing the company's Fabroil and Textolite silent gears, also is being distributed by the company.

"HotWater All the Time Electrically"—This is the title of a new leaflet describing the F. & S. automatic electric water heaters manufactured by **Fichtner & Simon,** 505 Gough St., San Francisco.

Pocket Catalog—A fully illustrated catalog of a handy size for slipping in the pocket has been prepared by the **Pittsburgh Reflector Company,** 304 Ross St., Pittsburgh. It contains complete information on Permaflectors, the silver-plated glass reflectors with the permanent reflecting surface manufactured by the company, together with numerous illustrations of installations.

Protective Equipment — Under the title "U-Re-Lite All-Steel Distribution Groups," the **I-T-E Circuit Breaker Company,** Nineteenth and Hamilton Sts., Philadelphia, has published Bulletin No. 220 which covers "an entirely new type of electrical protective equipment." Copies of the bulletin will be forwarded to all interested parties upon request.

New Supplement to O-B Catalog—Supplement No. 2 to catalog No. 20 has been issued by the **Ohio Brass Company,** Mansfield, Ohio. This supplement, which supersedes and replaces supplement No. 1 of March, 1928, contains information on new O-B products announced since the issuance of catalog No. 20.

Distribution Transformers — Announcement has been made by the **Wagner Electric Corporation,** 6400 Plymouth Ave., St. Louis, that it has prepared a new 52-page catalog describing its distribution transformers in single-phase and three-phase, pole-type and subway-type, in ratings up to and including 500 kva. One-half of the catalog is devoted to a detailed description of the design and construction of the distribution transformers, and the remainder of the catalog is given over to ratings, shipping weights, prices and other information. Copies may be obtained by request for Bulletin No. 160.

Sumpter Compression Type Connectors for Equipment Leads—A new publication describing and illustrating Sumpter compression-type connectors for transformers, manufactured by the **Delta-Star Electric Company,** 2400 Block, Fulton St., Chicago, is Bulletin No. 38-CB.

The DeLaval Method of Purifying Transformer Oil and Switch Oil—This is the title of a new bulletin recently published by the **DeLaval Pacific Company,** 61 Beale St., San Francisco. The bulletin features the company's new No. 700 series DeLaval machine, particularly the new No. 700 portable insulating oil purifier.

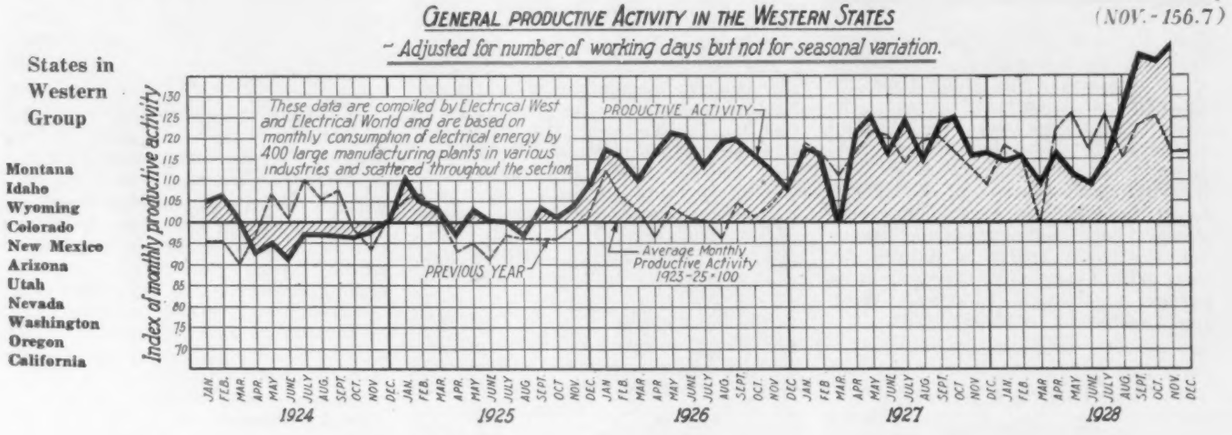
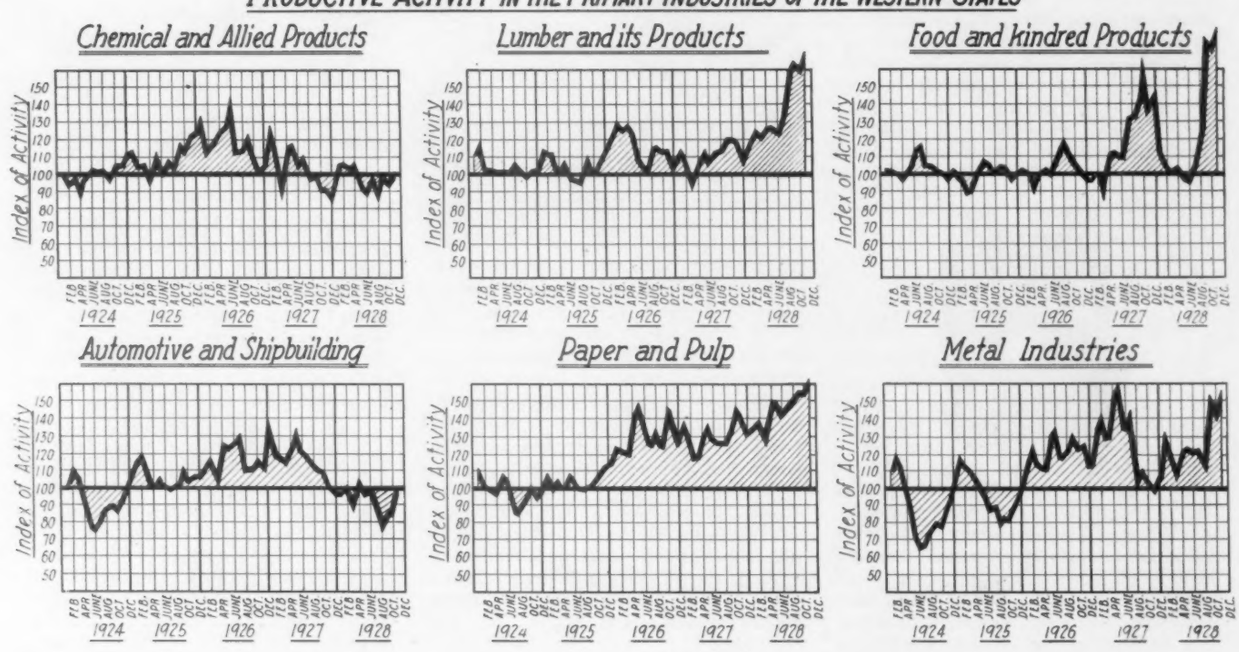
Worthington Vertical Feather-Valve Compressors—Bulletin No. L-620-B1, being distributed by the **Worthington Pump & Machinery Corporation,** 2 Park Ave., New York City, describes and illustrates this type of compressor. The information is furnished in concise form through the question-and-answer method.

ELECTRICAL WEST Barometer of Industrial Activity in Western States

THAT the manufacturing plants of the Western states are sharing to the fullest the remarkable prosperity which is prevalent throughout the Eastern states is indicated by reports received on the monthly consumption of electrical energy by about 400 large manufacturing plants scattered throughout the section. The rate of operations during November, after corrections are made for the number of working days, was by far the highest ever recorded by the manufacturing plants of the Western states. November operations were at a rate of 5.4 per cent over October, 3.9 per cent above the previous peak of activities recorded in September, and 34.0 per cent over November, 1927.

Only one of the manufacturing groups in the Western states is operating on a lower plane than at this time last year. The chemicals and allied products industrial group reported November operations at a rate 8.8 per cent over November, 1927, food and kindred products 32.0 per cent, lumber and its products 40.8 per cent, metal industries group 60.2 per cent, paper and pulp 14.0 per cent, and rubber products 52.5 per cent. The stone, clay and glass industry on the other hand recorded a drop of 16.0 per cent under last year.

The rate of activity in the manufacturing plants in the nation as a whole was of record proportions during November, and 17.2 per cent over the corresponding month last year. All the primary manufacturing groups, with the exception of leather products and lumber and its products, showed a higher rate of operations than that of November, 1927. Contrasted with October of the year just past general activity increased by 2.2 per cent. With the exception of the Southern states, all sections of the country reported a higher rate of operations than a year ago.

Index of Industrial Activity in the Western States
(All figures adjusted for number of working days.)

	Nov. 1928	Oct. 1928	Nov. 1927	Av. for 1st 11 mo. 1928	Av. for 1st 11 mo. 1927
All industry	156.7	148.7	117.0	126.5	119.0
Chemicals and allied products	97.3	92.8	89.4	96.6	105.1
Food and kindred products	184.8	173.0	140.0	127.2	120.9
Lumber and its products	169.0	161.8	120.0	140.1	112.5
Metals group	156.8	148.7	97.8	130.8	129.0
Paper and pulp	162.4	156.8	142.6	147.8	133.4
Rubber and its products	164.2	183.5	107.7	155.1	
Shipbuilding	96.2	83.0	102.1	89.8	116.3
Stone, clay and glass	133.6	124.8	159.0	141.2	
All industry, United States	135.0	132.0	115.2	123.9	115.8